

Service Manual

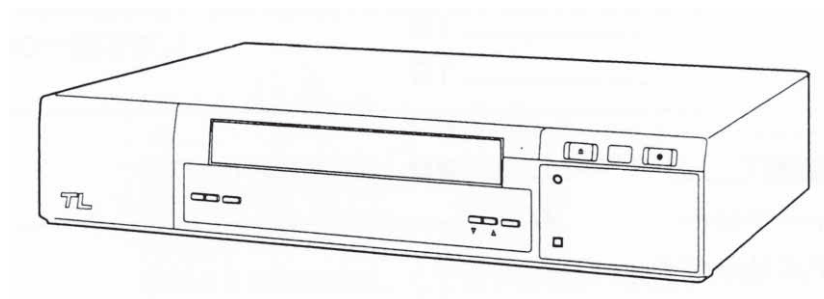


Time Lapse Recorder

AG-TL350E/B

Z-MECHANISM

- Sec. 1** *Operating Instructions*
- Sec. 2** *Service Information*
- Sec. 3** *Disassembly Procedures*
- Sec. 4** *Mechanism*
- Sec. 5** *Electrical Adjustments*
- Sec. 6** *Block Diagrams*
- Sec. 7** *Schematic Diagrams*
- Sec. 8** *Exploded Views & Replacement Parts List*



Please refer to the information of Z-Mechanism (Order No. VSD9706M201, VRD9802005C2)

Panasonic

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EXPLODED VIEWS & REPLACEMENT PARTS LISTS

1. *Be sure to make your orders of replacement parts according to this list.
2. Unless otherwise specified, all resistors are in OHMS, K=1,000 OHMS, all capacitors are in MICROFARADS (μF), P=μμF.
3. The P.C. Board untills marked with "■" shown below the main assembled parts.
4. The parts marked with Ⓔ on the exploded view show the electric parts.
5. **IMPORTANT SAFETY NOTICE**
Components identified with the mark ⚠ have the special characteristics for safety. When replacing any of these components, use only the same type.
6. The marking (RTL) indicates the retention time is limited for this item.
After the diacontinuation of this assembly in production, it will no longer be available.

Mechanical Replacement Parts List & Exploded ViewsPRT-1

Mechanical Chassis AssemblyPRT-1

Chassis Frame AssemblyPRT-3


Packing Parts Assembly.....PRT-5

Ref.No.	Part No.	Part Name & Description	Pcs	Remarks
	VFK0329	POST ADJ. SCREWDRIVER	1	
	VFK0132A	BACK TENSION METER	1	
	VFK0330	FINE ADJ. SCREWDRIVER	1	
	VFK0326	HEX. WRENCH SET	1	
	VFK0948A	CHECK LIGHT	1	
	MOR265	MOLYTONE GREASE	1	
	VFK27	HEAD CLEANING STICK	1	
	VFJ8125H3F	ALIGNMENT TAPE (PAL)	1	
	VFM8080H0FP	ALIGNMENT TAPE (NTSC)	1	

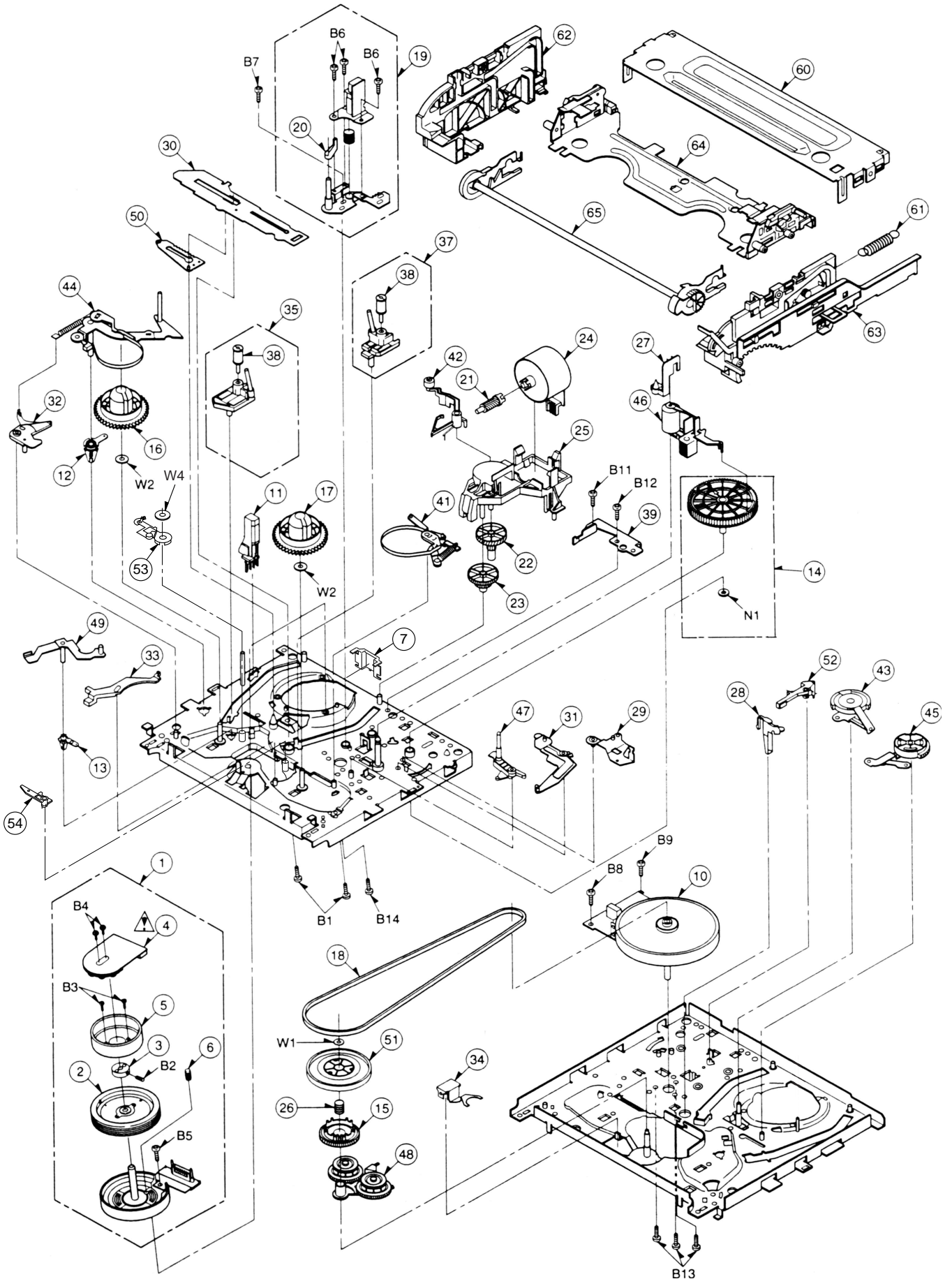
Components identified with the mark Δ have the special characteristics for safety.
When replacing any of these components, use only the same type.

MECHANICAL CHASSIS ASSEMBLY

Ref.No.	Part No.	Part Name & Description	Pcs	Remarks	Ref.No.	Part No.	Part Name & Description	Pcs	Remarks
1 (1)	VEG1550	CYLINDER UNIT	1		W2 (1)	VMX2650	WASHER	2	
2 (1)	VXP2052	UPPER CYLINDER UNIT	1		W4 (1)	VMX2699	WASHER	1	
3 (1)	VDB1256	CYLINDER RETAINER	1						
Δ 4 (1)	VEK8840	STATOR ASS'Y	1						
5 (1)	VXP1956	ROTOR ASS'Y	1						
6 (1)	VXS0135	EARTH BRUSH ASS'Y	1						
10 (1)	VEK9203	CAPSTAN ASS'Y	1						
11 (1)	VBS0155	FE HEAD	1						
12 (1)	VDB1431	TENSION ARM BOSS	1						
13 (1)	VDB1460	SUPPLY BRAKE ARM BOSS	1						
14 (1)	VDG1220KIT	MAIN CAM GEAR	1						
15 (1)	VDG1221	CONVERSION GEAR	1						
16, 17 (1)	VDR0350	TAKE UP REEL TABLE	2						
18 (1)	VDV0382	CAPSTAN BELT	1						
19 (1)	VED0412	A/C HEAD ASS'Y	1						
20 (1)	VMX2656	P4 CAP	1						
21 (1)	VDG1217	WORM GEAR	1						
22 (1)	VDG1218	WORM WHEEL GEAR	1						
23 (1)	VDG1219	CENTER GEAR	1						
24 (1)	VEM0604	LOADING MOTOR ASS'Y	1						
25 (1)	VMD2619	MOTOR BRACKET	1						
26 (1)	VMB3045	CONVERSION GEAR SPRING	1						
27 (1)	VMD2620	OPENER PIECE	1						
28 (1)	VMD2738	LED PRISM	1						
29 (1)	VML3165	DRIVE RACK ARM	1						
30 (1)	VML3166	MAIN LEVER	1						
31 (1)	VML3167	DRIVE MAIN LEVER ARM	1						
32 (1)	VML3172	SUPPLY SPRING ARM	1						
33 (1)	VML3176	CONVERSION LEVER A	1						
34 (1)	VML3177	CONVERSION LEVER B	1						
35 (1)	VXA6040	INCLINED BASE (S) ASS'Y	1						
37 (1)	VXA5854	INCLINED BASE (T) ASS'Y	1						
38 (1)	VXP1840	ROLLER POST	2						
39 (1)	VMA9672	SUPPORT ANGLE	1						
41 (1)	VXL2667	TAKE UP BRAKE ARM ASS'Y	1						
42 (1)	VXL2669	CLEANER ARM ASS'Y	1						
43 (1)	VXL2670	TAKE UP LOADING ARM ASS'Y	1						
44 (1)	VXL2793	TENSION ARM ASS'Y	1						
45 (1)	VXL2672	SUPPLY LOADING ARM ASS'Y	1						
46 (1)	VXL3037	PINCH ARM ASS'Y	1						
47 (1)	VXL2677	P5 ARM ASS'Y	1						
48 (1)	VXL2792	IDLER ARM ASS'Y	1						
49 (1)	VXL2737	CLAW LOWER ARM ASS'Y	1						
50 (1)	VXL2747	LOADING RACK ASS'Y	1						
51 (1)	VXP2035	CENTER CLUTCH ASS'Y	1						
52 (1)	VXZ0430	SS BRAKE ARM ASS'Y	1						
53 (1)	VXL2783	REV ARM ASS'Y	1						
54 (1)	VML3276	IDLER POSITIONING ARM	1						
60 (1)	VMA9516	TOP PLATE	1						
61 (1)	VMB3047	CONNECTION SPRING	1						
62 (1)	VMD3379	SIDE PLATE (L)	1						
63 (1)	VXA6607	SIDE PLATE (R) ASS'Y	1						
64 (1)	VXA5746	CASSETTE HOLDER ASS'Y	1						
65 (1)	VXP1730	MAIN SHAFT ASS'Y	1						
B1 (1)	VHD1117	SCREW	2						
B2 (1)	VHD0842	SCREW	1						
B3 (1)	VHD0843	SCREW	2						
B4 (1)	VHD0844	SCREW	2						
B5 (1)	XYN26+C5	SCREW	1						
B6 (1)	VHD1066	SCREW	3						
B7 (1)	VHD1044	SCREW	1						
B8 (1)	VHD1060	SCREW	1						
B9 (1)	VHD1071	SCREW	1						
B11 (1)	XTS26+6F	SCREW	1						
B12 (1)	XTN26+6F	SCREW	1						
B13 (1)	XTN26+7J	SCREW	3						
B14 (1)	VHD1095	SCREW	1						
N1 (1)	VHN0311	PUSH NUT	1						
W1 (1)	VMX2208	CUT WASHER	1						

Components identified with the mark  have the special characteristics for safety.
When replacing any of these components, use only the same type.

MECHANICAL CHASSIS ASSEMBLY



CHASSIS FRAME ASSEMBLY

Components identified with the mark have the special characteristics for safety. When replacing any of these components, use only the same type.

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CHASSIS FRAME ASSEMBLY

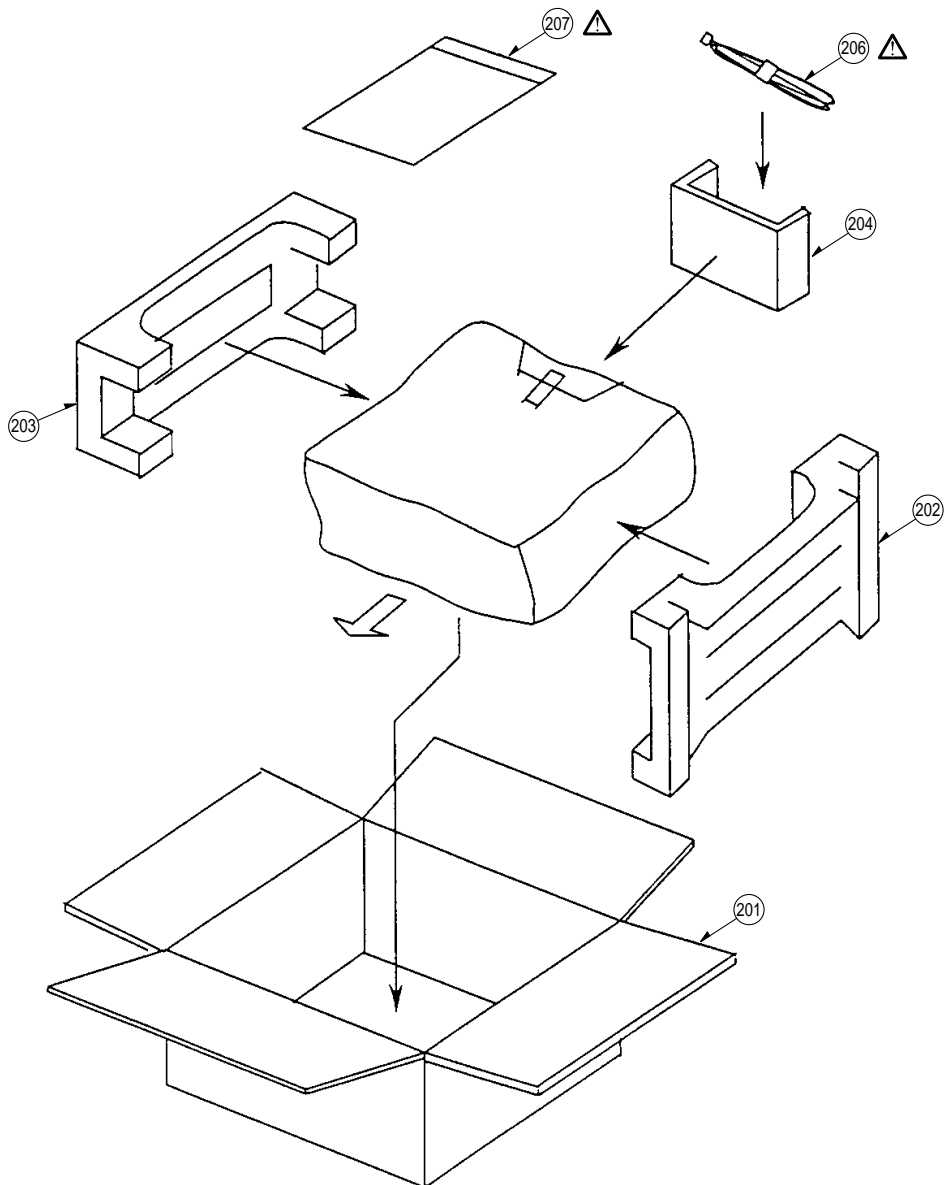
Components identified with the mark have the special characteristics for safety. When replacing any of these components, use only the same type.




PRT-4

PACKING PARTS ASSEMBLY Components identified with the mark have the special characteristics for safety. When replacing any of these components, use only the same type.

Components identified with the mark  have the special characteristics for safety. When replacing any of these components, use only the same type.



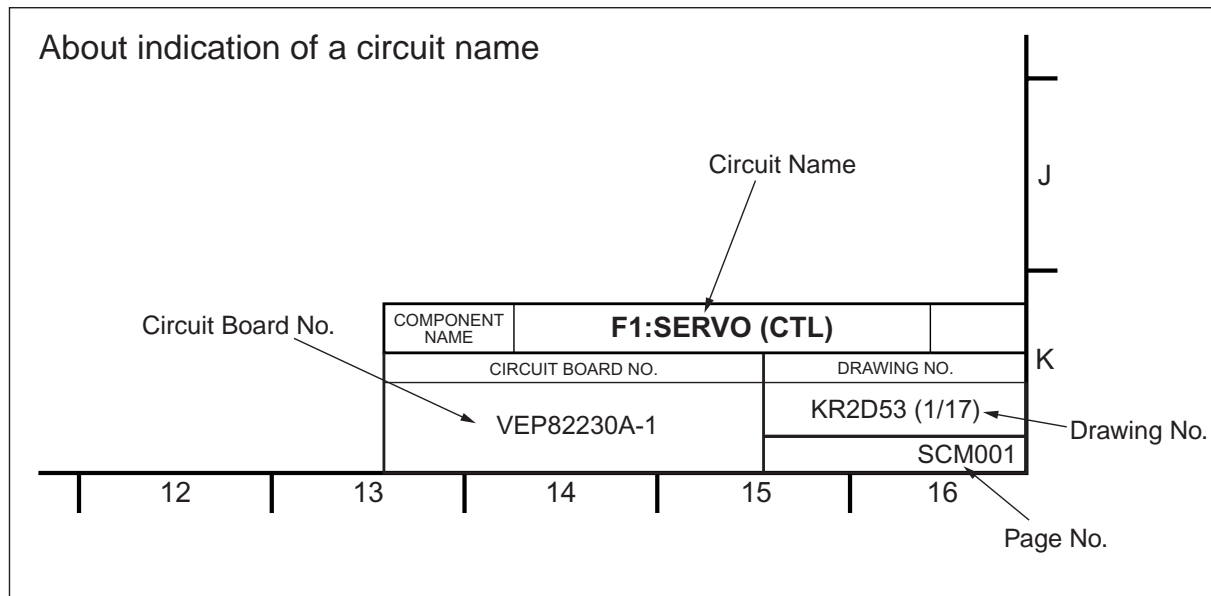
PACKING PARTS ASSEMBLY Components identified with the mark have the special characteristics for safety. When replacing any of these components, use only the same type.

Components identified with the mark  have the special characteristics for safety. When replacing any of these components, use only the same type.

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SECTION 7

SCHEMATIC DIAGRAMS



NOTE:
BE SURE TO MAKE YOUR ORDERS OF REPLACEMENT PARTS ACCORDING TO PARTS LIST.

CAUTION

THE ☐ MARK INDICATES THE PRIMARY CIRCUIT TO DISTINGUISH THE PRIMARY FROM THE SECONDARY CIRCUIT.
PAY ATTENTION NOT TO RECEIVE AN ELECTRIC SHOCK DURING REPAIR AND SERVICE OF THE PRODUCTS.

IMPORTANT SAFETY NOTICE:

COMPONENTS IDENTIFIED WITH THE MARK HAVE THE SPECIAL CHARACTERISTICS FOR SAFETY.
WHEN REPLACING ANY OF THESE COMPONENTS, USE ONLY THE SAME TYPE.

CONTENTS

MAIN

CONNECTOR (1/32).....	SCM1
SYS_IF (2/32).....	SCM2
L1/VIDEO_IN (3/32)	SCM3
L1/REC VPLD (4/32).....	SCM4
L1/EE1_MEMORY (5/32)	SCM5

FRONT L

FRONT_L (1/1).....	SCM6
--------------------	------

FRONT R

FRONT_R (1/1).....	SCM7
--------------------	------

REAR JACK

REAR JACK (1/1).....	SCM8
----------------------	------

MIC JACK

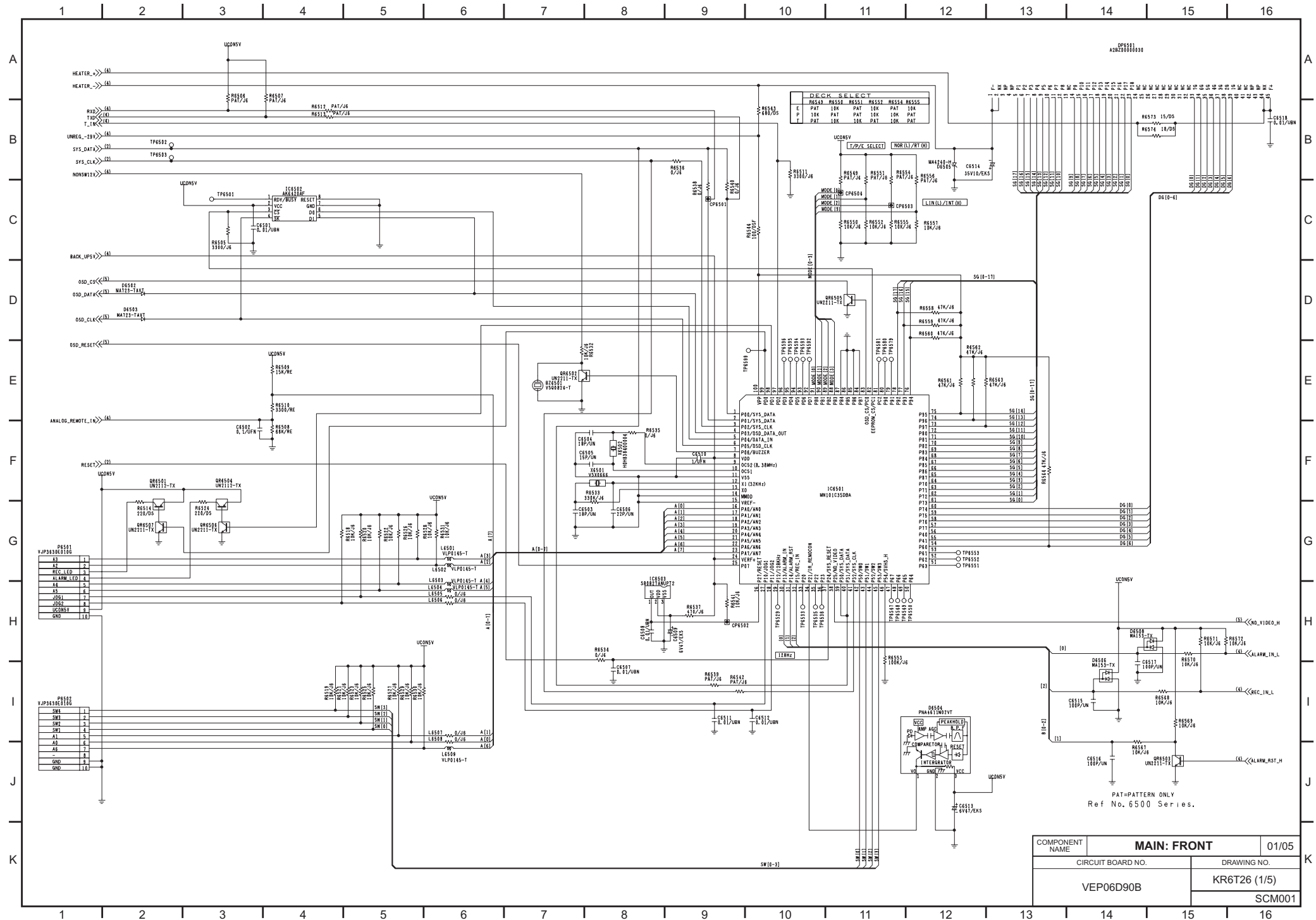
MIC JACK (1/1)	SCM9
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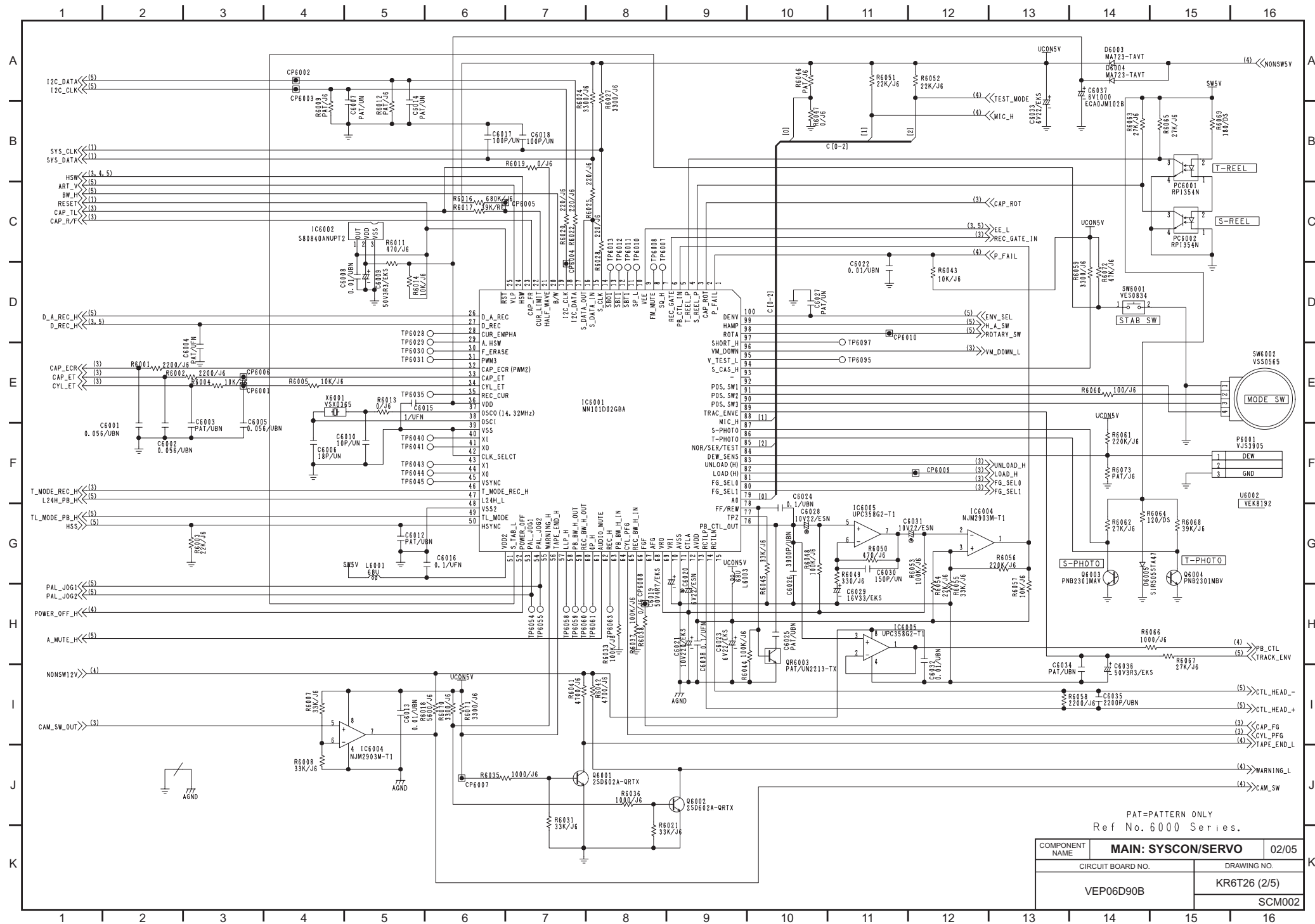
POWER SUPPLY

POWER SUPPLY (1/1)	SCM10
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INTERCONNECTION

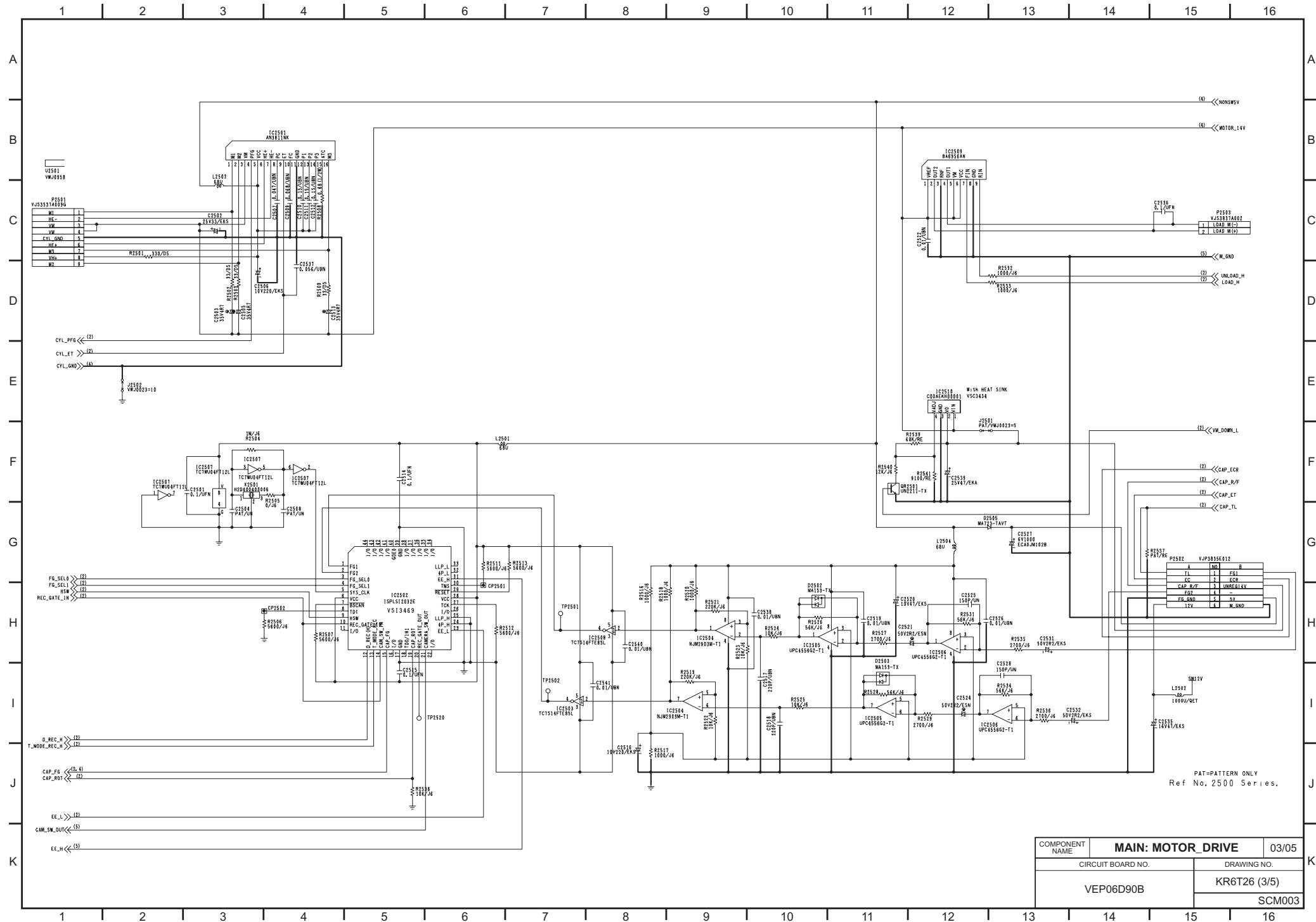
INTERCONNECTION (1/1).....	SCM11
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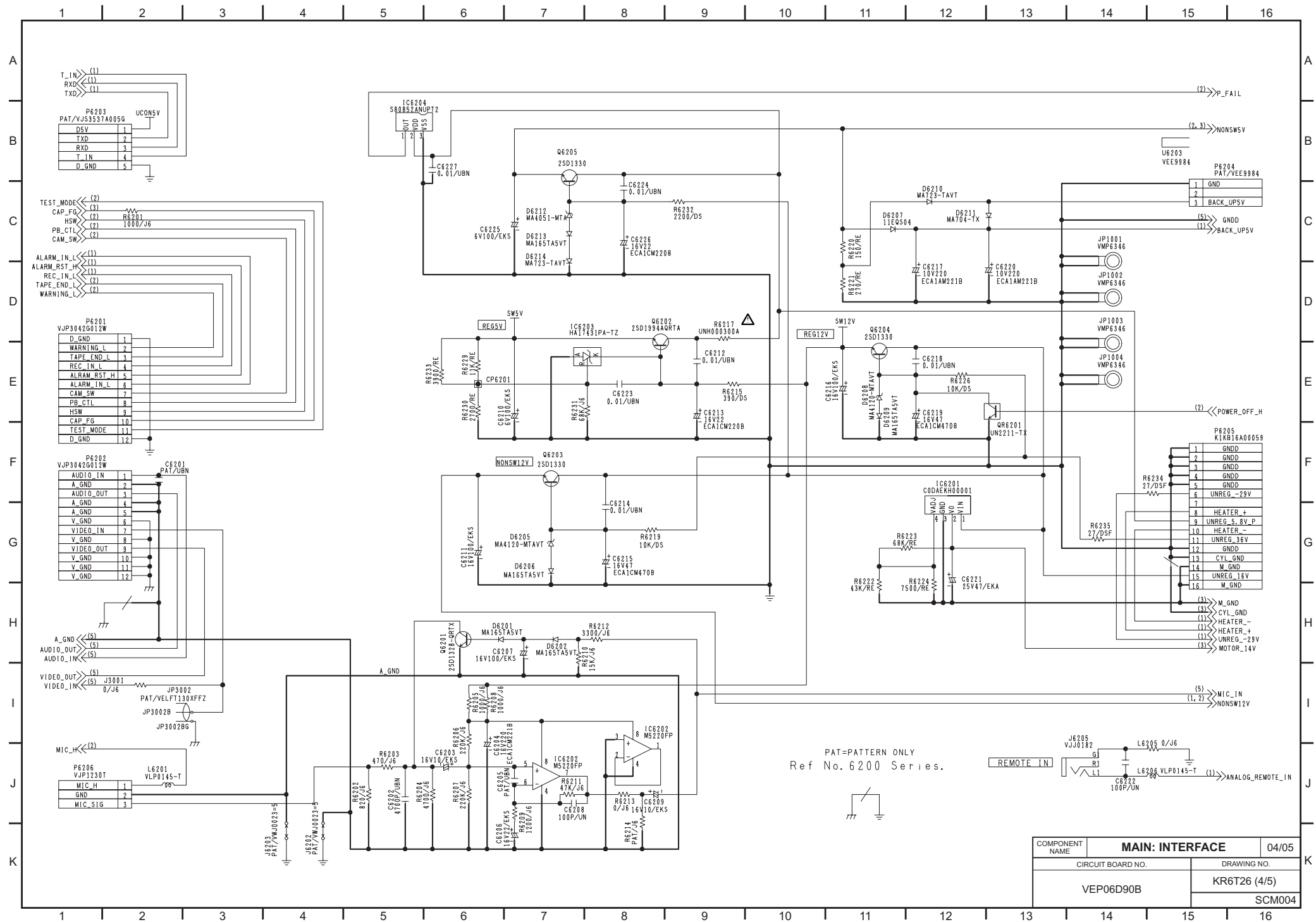




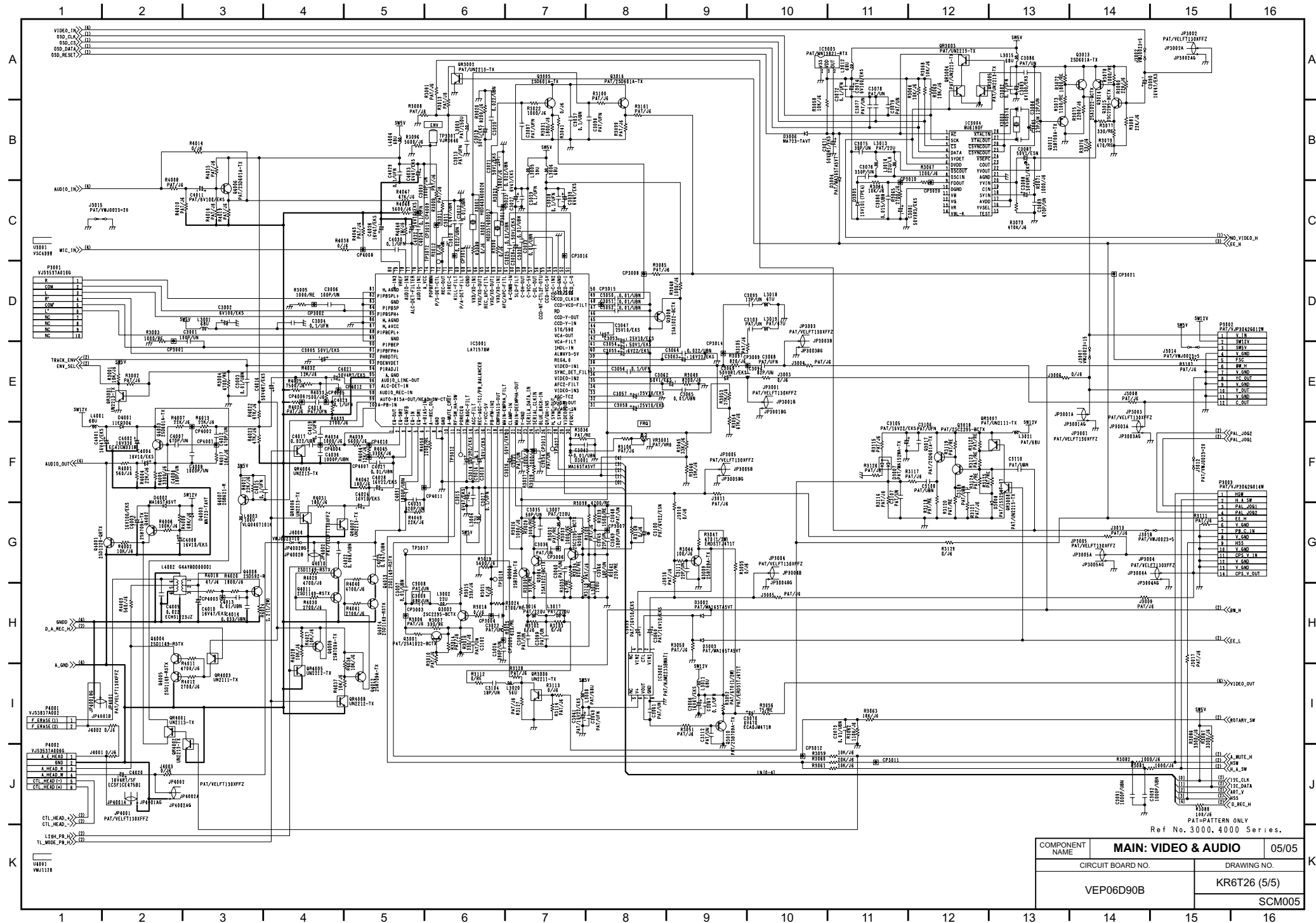
PAT=PATTERN ONLY
Ref No. 6000 Series.

COMPONENT NAME	MAIN: SYSCON/SERVO		02/05
CIRCUIT BOARD NO.		DRAWING NO.	
VEP06D90B		KR6T26 (2/5)	
		SCM002	

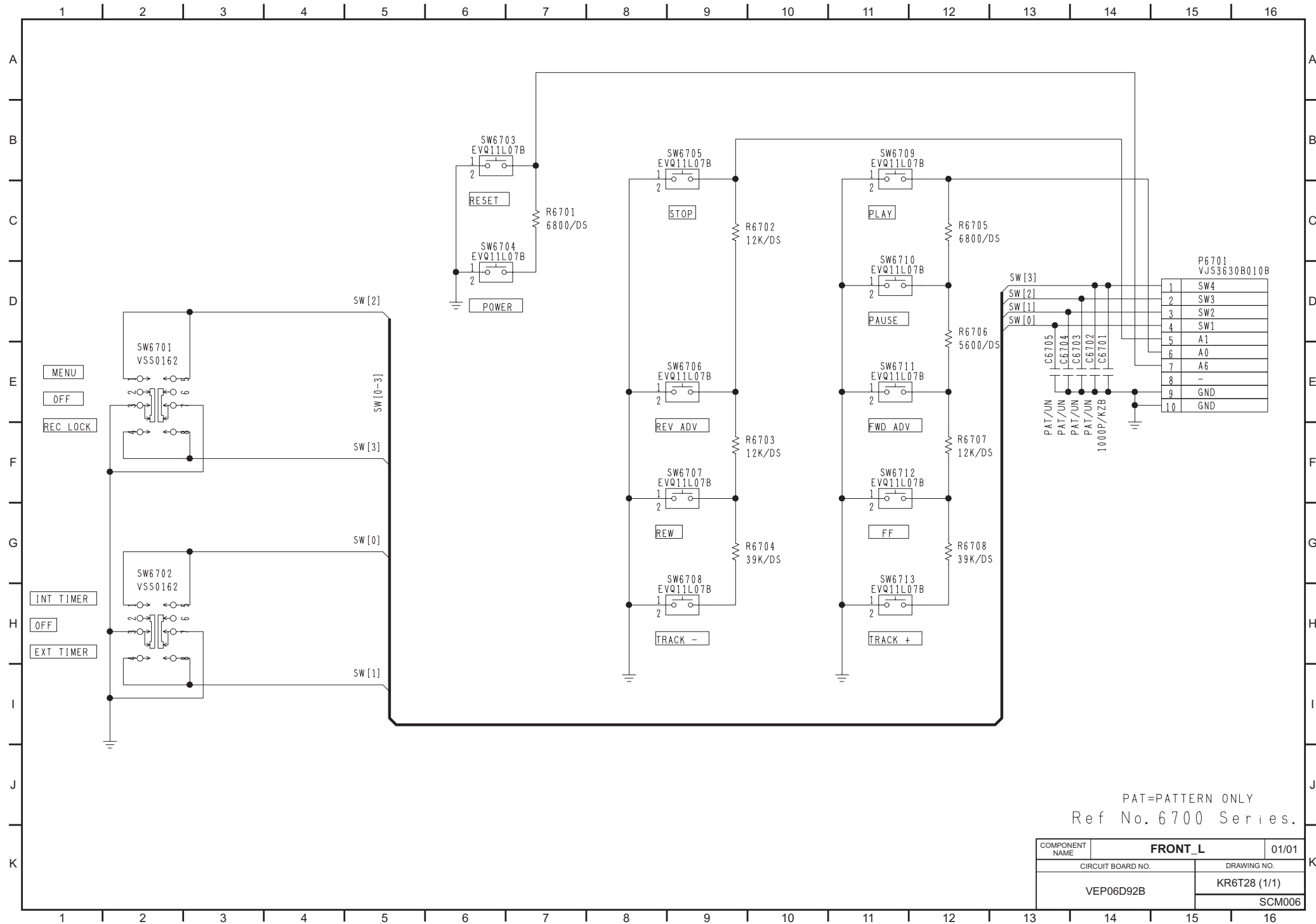




COMPONENT NAME	MAIN: INTERFACE		04/05
CIRCUIT BOARD NO.		DRAWING NO.	
VEP06D90B		KR6T26 (4/5)	
		SCM004	

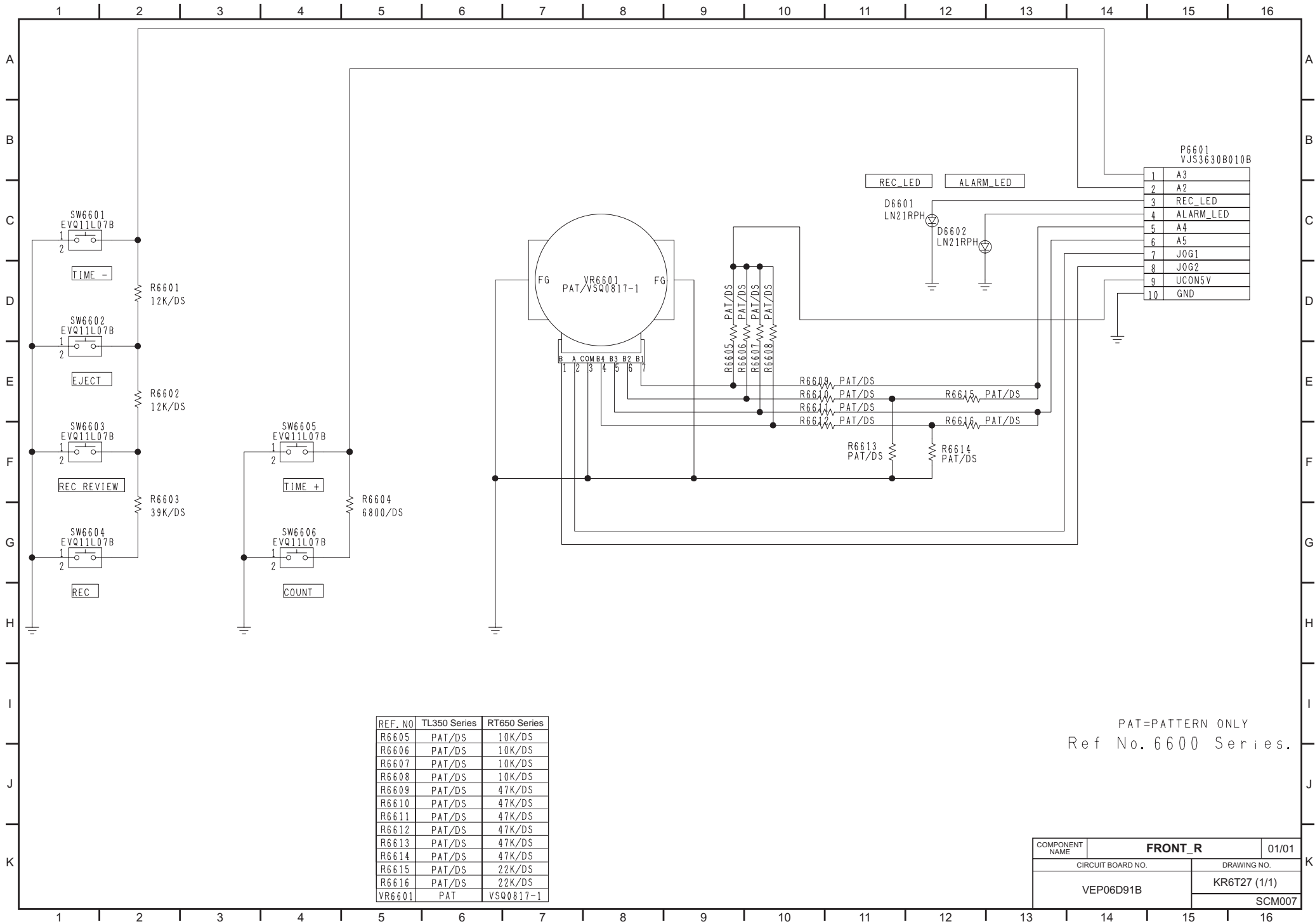


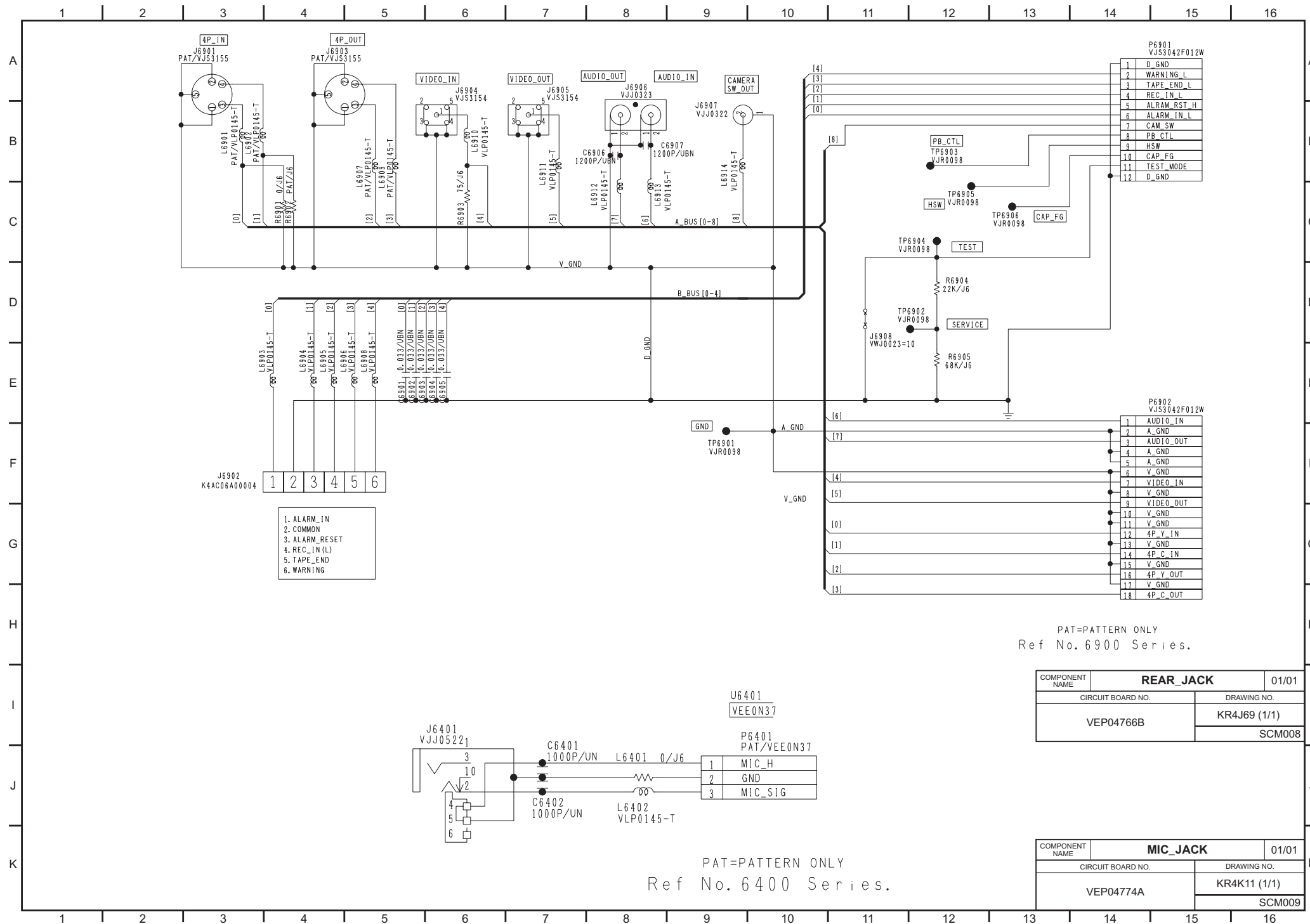
COMPONENT NAME	MAIN: VIDEO & AUDIO		05/05
CIRCUIT BOARD NO.		DRAWING NO.	
VEP06D90B		KR6T26 (5/5)	
		SCM005	

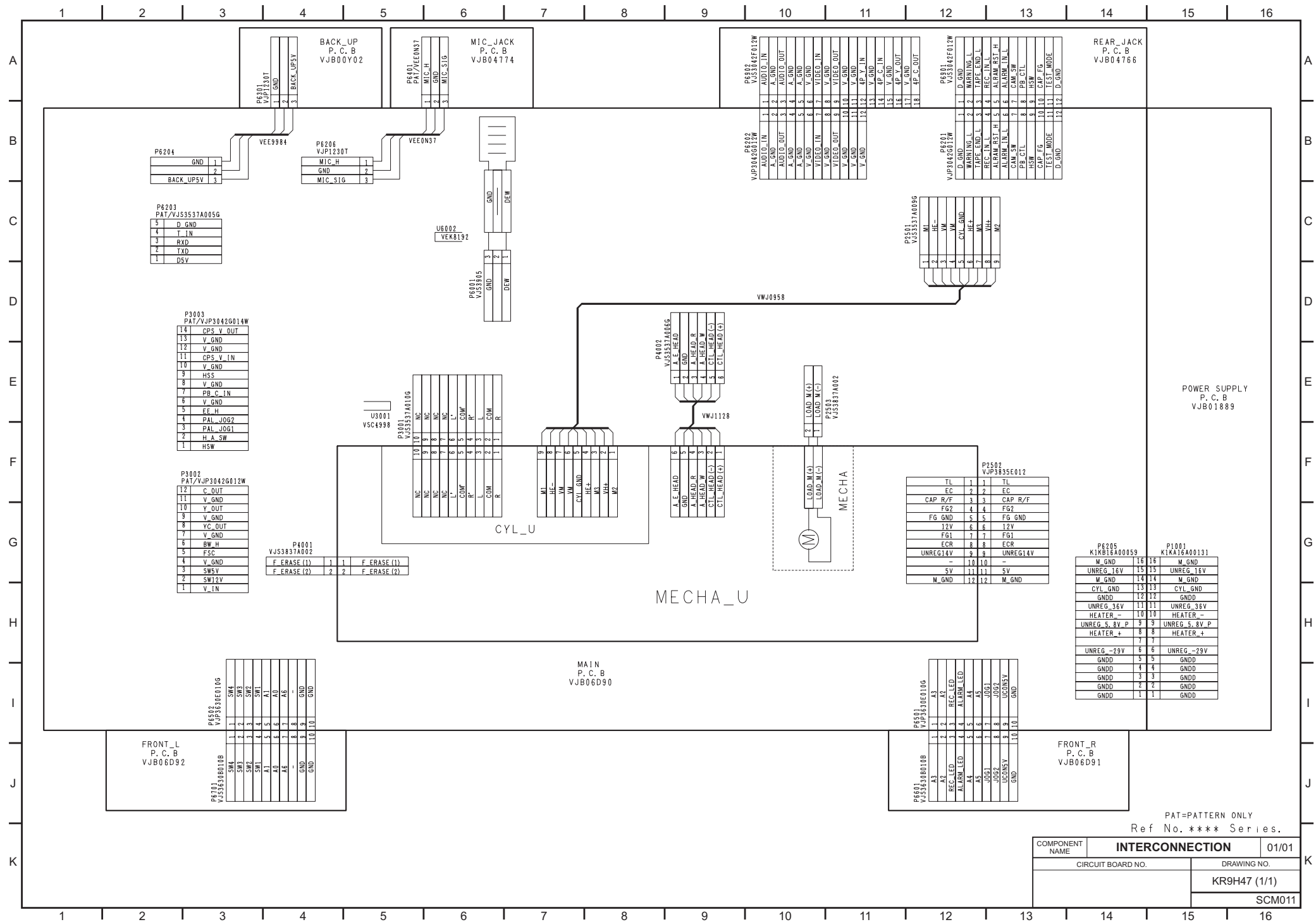


PAT=PATTERN ONLY
Ref No. 6700 Series.

COMPONENT NAME	FRONT_L	01/01
CIRCUIT BOARD NO.	DRAWING NO.	
VEP06D92B	KR6T28 (1/1)	
	SCM006	







PAT=PATTERN ONLY
Ref No. **** Series.

COMPONENT NAME	INTERCONNECTION		01/01
CIRCUIT BOARD NO.		DRAWING NO.	
		KR9H47 (1/1)	
		SCM011	

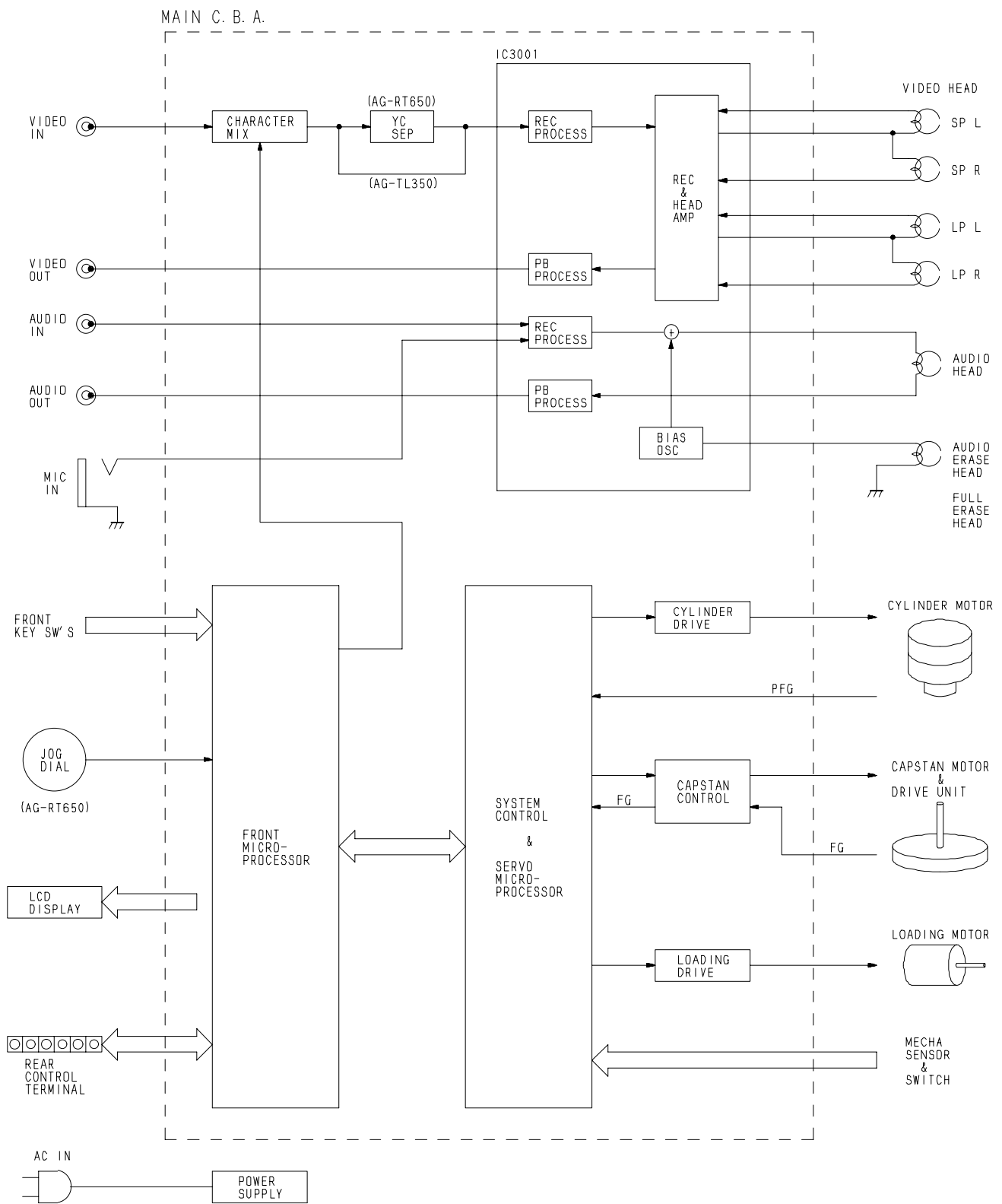
SECTION 6

BLOCK DIAGRAMS

CONTENTS

OVERALL BLOCK DIAGRAM	BLK-1
VIDEO/AUDIO BLOCK (MAIN C.B.A.) DIAGRAM.....	BLK-2
SYSTEM CONTROL/SERVO BLOCK (MAIN C.B.A.) DIAGRAM	BLK-3
FRONT BLOCK (MAIN C.B.A.) DIAGRAM.....	BLK-4

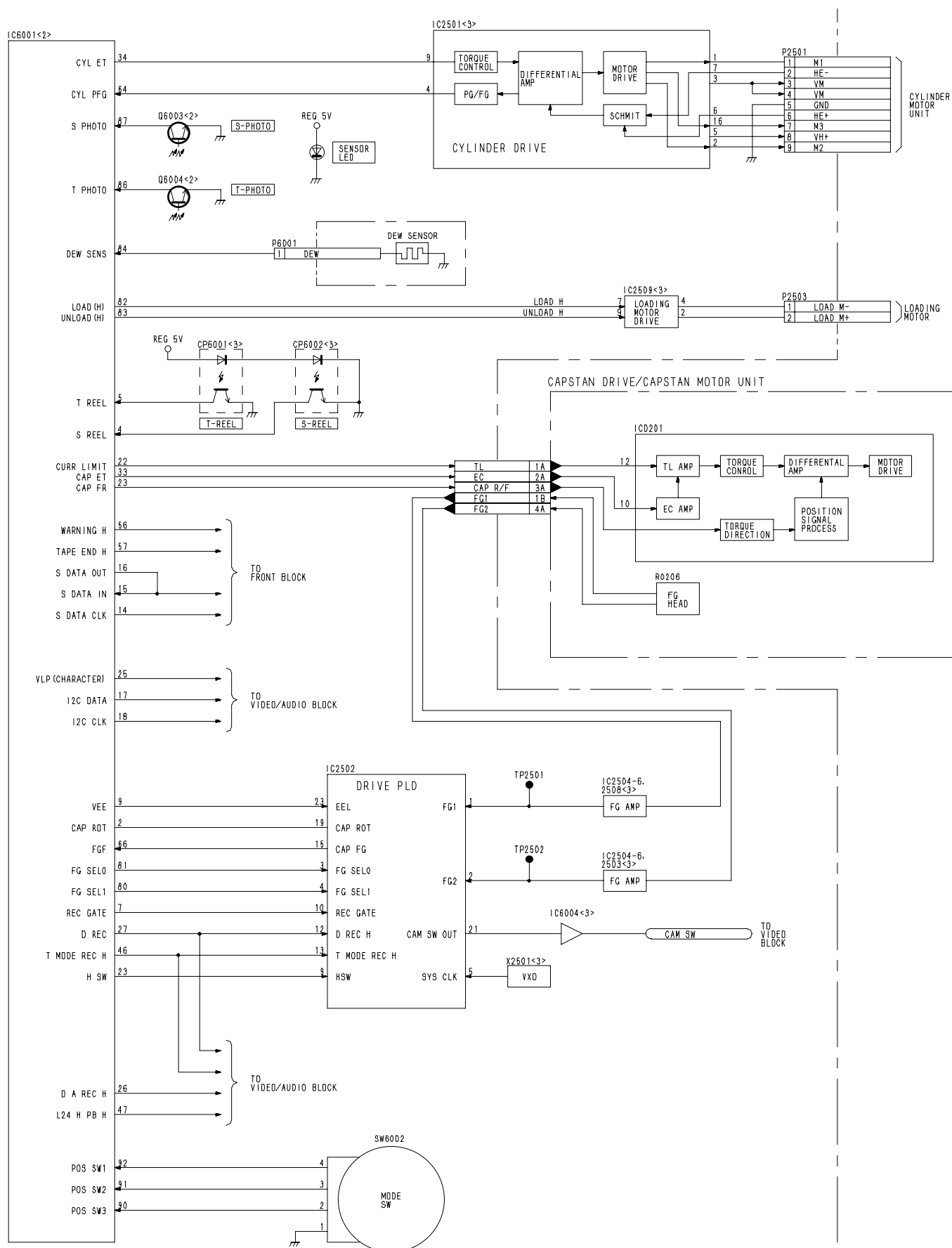
OVERALL BLOCK DIAGRAM



REAR JACK
C. B. A.

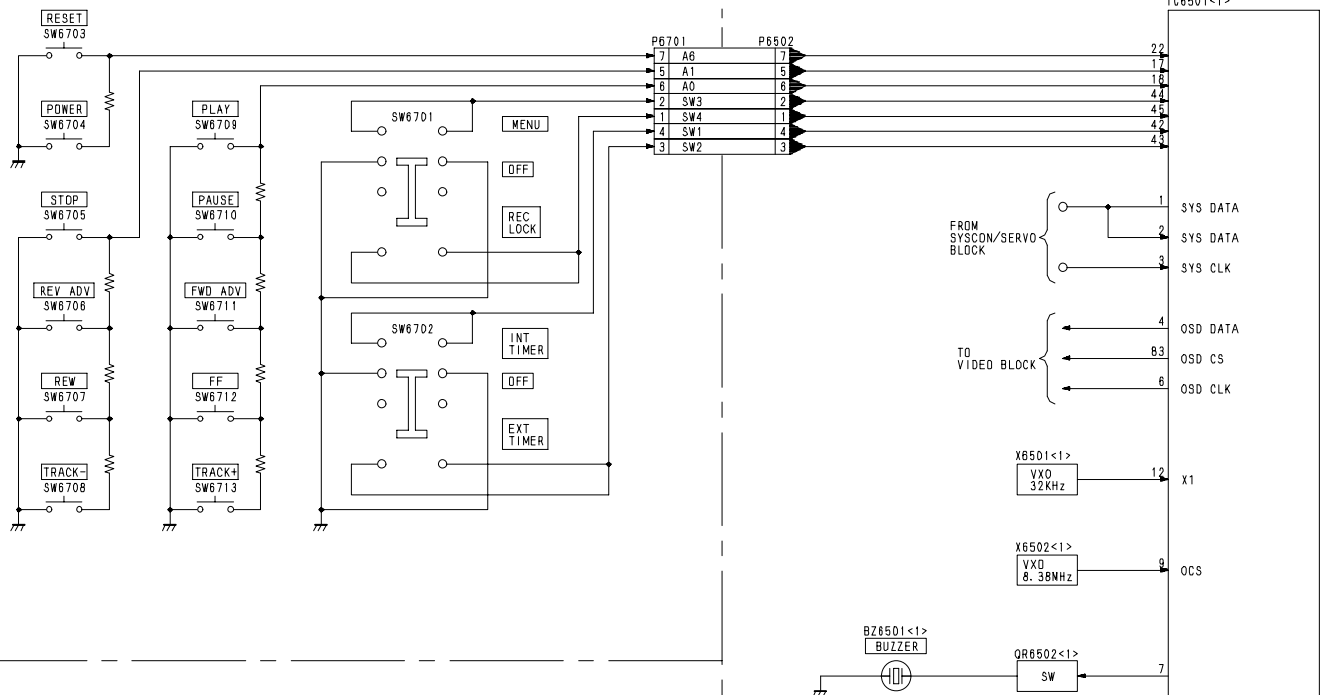


SYSTEM CONTROL/SERVO BLOCK (MAIN C.B.A.) DIAGRAM

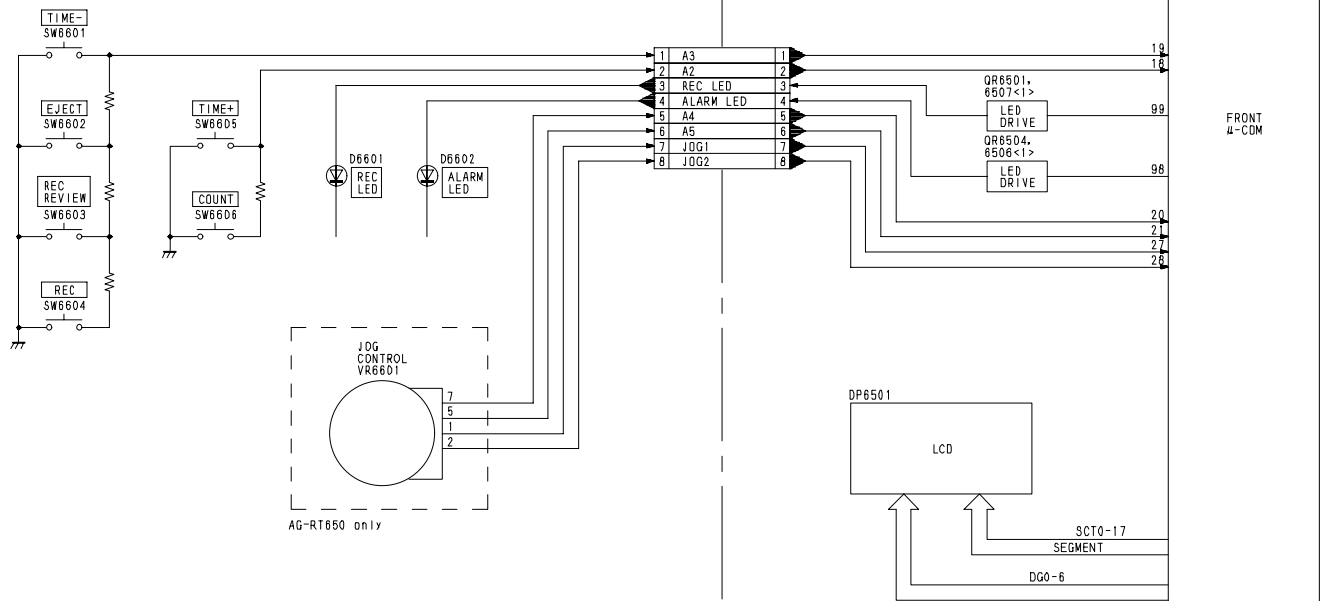


FRONT BLOCK (MAIN C.B.A.) DIAGRAM

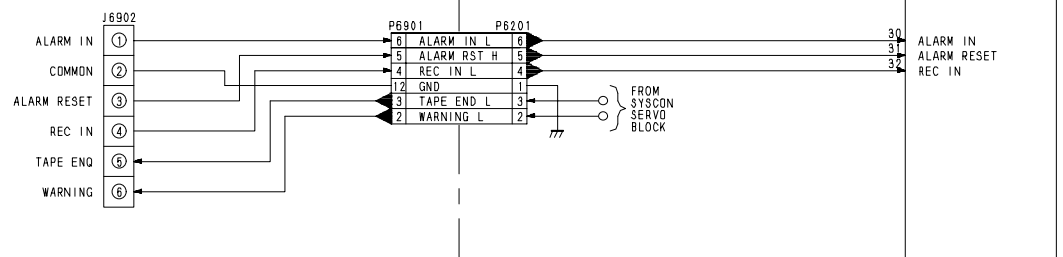
FRONT L C. B. A.



FRONT R C. B. A.



REAR JACK C. B. A.



SECTION 5

ELECTRICAL ADJUSTMENT

CONTENTS

Special Adjustment Procedures for the early products	EAD-1
1.PG Shifter Adjustment	EAD-2
2.Slow Free Run Adjustment	EAD-2
3.E-E Level Adjustment.....	EAD-2

Special Adjustment Procedures for the early products

Following adjustment procedures is necessary for early products.

(This procedure should be necessary until the new program is introduced to the Microprocessor of the FRONT circuit. The detail information of it will be announced in the Supplement Service manual later.)

Take notes of the Menu setting items.



Power OFF the unit, and connect a jumper wire between TP6902 and TP6901 on the Rear Jack C.B.A.



Perform the Slow Free Run Adjustment.(Refer to procedure)



Perform the PG Shifter Adjustment.(Refer to procedure)

- ① During PG Shifter adjustment, disconnect the power cable from AC outlet within 1 to 4 seconds after the picture color changed to black screen from blue screen on the Monitor.
- ② Connect the oscilloscope to TP6504 (Located on VR3001 pattern of the Main C.B.A.), then confirm the pulse appears about 5 seconds after power cable is connected to AC outlet.
- ③ If pulse appear less then second (about 0.1sec), repeat the PG Shifter adjustment.



Setting of Video Freq. Response Value

- ① At STOP mode, press the Tracking (+),(-) and Counter keys simultaneously to set the Adj_1 mode.
- ② Playback the Alignment tape, then press the F.ADV or R.ADV key to set "0101" as display on the LCD counter.

To next paragraph

(Continue to setting of Video Freq. Response Value)

- ③ Return to STOP mode, press the Tracking (+),(-) and Counter keys simultaneously to set the Adj_2 mode.
- ④ Playback the Alignment tape, then press the F.ADV or R.ADV key to set following value as display on the LCD counter.
AG-RT650 : 11
AG-TL350 : 49
- ⑤ Return to STOP mode again, press the Tracking (+),(-) and Counter keys simultaneously to return to the Normal mode.



Initialization of Menu setting (1) Service mode

- ① Press the Power button to turn OFF the unit.
- ② Set REC_LOCK switch to "REC_LOCK" position.
- ③ Pressing FF and REW buttons together, press the Power button to keep holding until stop blinking of Clock display on the LCD counter.

*Reset the Hour meter information too.



Initialization of Menu setting(2) Normal mode

- ① Press the Power button to turn OFF the unit and disconnect a jumper from the Rear Jack C.B.A..
- ② Set REC_LOCK switch to "REC_LOCK" position.
- ③ Pressing FF and REW buttons together, press the Power button to keep holding until stop blinking of Clock display on the LCD counter.



Re-set Main menu according to notes of first step in this procedures.



Exist

1. PG Shifter Adjustment

1. Turn OFF power.
2. Connect the jumper wire between TP6902 and TP6901 on the Rear Jack C.B.A..
3. Turn ON power.
4. Insert the Alignment Tape (NTSC: VFM8080HQFP, PAL: VFM8180HADH: 3rd portion)
5. Confirm the unit is in STOP mode, then press the TRACKING , and TIME MODE ▼ buttons simultaneously.
6. Place the unit into automatic adjustment mode after the unit goes to PLAY mode.
7. When the adjustment is completed, the unit goes to STOP mode.
8. When this adjustment is terminated (keep PLAY mode), the following code appear on the FLP display.

CODE	Contents
F1	CYLINDER rotation is unstable during adjustment mode.
F2	No synchronized signal up to 5 sec during adjustment mode.
F3	Not specified for fixed position of the CYLINDER.
F4	Servo not locked up to 10 sec during adjustment mode.

Note: Do not press any key during adjustment.

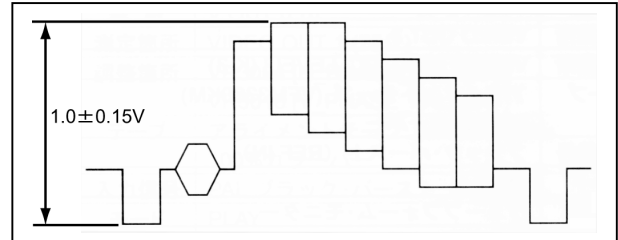
2. Slow Free Run Adjustment

1. Turn OFF power.
2. Connect the jumper wire between TP6902 and TP6901 on the Rear Jack C.B.A..
3. Turn ON power
4. Insert the Alignment Tape (NTSC: VFM8080HQFP, PAL: VFM8180HADH: 3rd portion)
5. Confirm the unit is in STOP mode, then press the TRACKING , and TIME MODE ▲ buttons simultaneously.
6. Place the unit into automatic adjustment mode, after the unit goes to PLAY and STILL mode.
7. When the adjustment is completed, the unit goes to STOP mode.
8. When this adjustment is terminated (keep PLAY mode), the following code appear on the FLP display.

CODE	Contents
F6	Not Specified.
F7	Force to step the adjustment during adjustment mode.

3. EE Level Adjustment (AG-RT650P only)

1. Connect the oscilloscope to the Video out terminal.
2. Confirm the video level so that $1.0 \pm 0.15V$ p-p.
3. If not, adjust VR3501 to be in specification.



SECTION 4

MAINTENANCE AND MECHANISM

CONTENTS

MAINTENANCE	
1. REGULAR MAINTENANCE	MEC-1
2. CYLINDER UNIT REPLACEMENT	MEC-2
MECHANICAL ADJUSTMENT INFORMATION	
1. TEST POINT.....	MEC-4
2. SPECIFICATION	MEC-4

Maintenance

1. REGULAR MAINTENANCE

The purpose of periodic maintenance is to preserve the functioning of this machine throughout its useful life. The user or service dealer should perform these maintenance regularly to ensure that maximum utility is obtained from the machine.

The VCR is a complicated place of equipment. It contains many belts, rollers, heads etc., which become worn, and deteriorate as time goes by, causing trouble. Dust and dirt will also impede the proper functioning of the machine. In light of this, it is very important that overall maintenance is done according to the maintenance chart to maintain the functions of the VCR, and to avoid accidental problems. This maintenance should also be performed after any repairs are done on the equipment.

The VCR used for business applications requires particular attention for several reasons. The installation conditions and applications are not always the best. Long use times, or poor environmental conditions may adversely affect the lifespan and performance of the machine. Regular maintenance assures that the purchaser obtains the maximum value for his expenditure. Accordingly, the necessity of regular maintenance should be fully explained at the time of sale, as well as during after-sale repairs.

1-2. MAINTENANCE CHART

The following periodic maintenance is required to prolong the life of the machine. (24H mode operation)

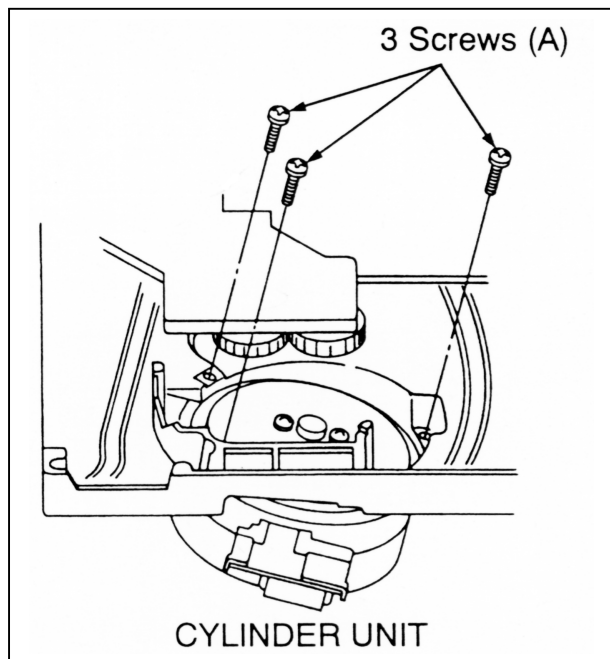
Parts Name	HOUR									
	500	1000	1500	2000	2500	3000	3500	4000	8000	12000
Tape Transporters	●	●	●	●	●	●	●	●	●	●
Upper Cylinder U	●	●	●	●	●	●	●	◎	◎	—
Cylinder U	●	●	●	●	●	●	●	●	●	◎
Capstan U	●	●	●	●	●	●	●	◎	◎	◎
FE HEAD	●	●	●	●	●	●	●	●	●	◎
A/C Head U	●	●	●	●	●	●	●	●	●	◎
Supply & Take Up Reel Table	●	●	●	●	●	●	●	●	●	△
Capstan Belt	●	●	●	●	●	●	●	◎	◎	◎
Loading motor U										◎
Brake Arm U										◎
Cleaner Arm U								◎	◎	◎
Tension Arm U										◎
Pinch Arm U								◎	◎	◎
Inclined Base (S) U										◎■
Inclined Base (T) U										◎■
Main Cam gear										◎□
Mode SW										◎
Detection SW										◎
Earth Plate										◎
P5 Arm U										◎
Center Clutch										◎
Idra arm U										◎
Convent Gear										◎

Symbol	Maintenace	Requirement	Remark
●	Cleaning	Ethyl-alcohol or Ceaning Liquid (Purchase locally)	Wipe dirt from the parts using soft cloth impregnated with Etyl-Alcohol. Note: When cleaning rubber parts, avoid using excessive alcohol since it may accelerate deterioration of these parts. After cleaning with alcohol, wipe the alcohol quickly and thoroughly.
◎	Replacement	-----	-----
△	Lubication	High Quality spindle Oil (VFK0131)	Supply one or two drops of oil.
■	Greasing	Molytone Grease (MOR265)	Wipe the old grease and apply new grease.
□	Greasing	Foil Grease (VFK1298)	Wipe the old grease and apply new grease.

2. CYLINDER UNIT REPLACEMENT

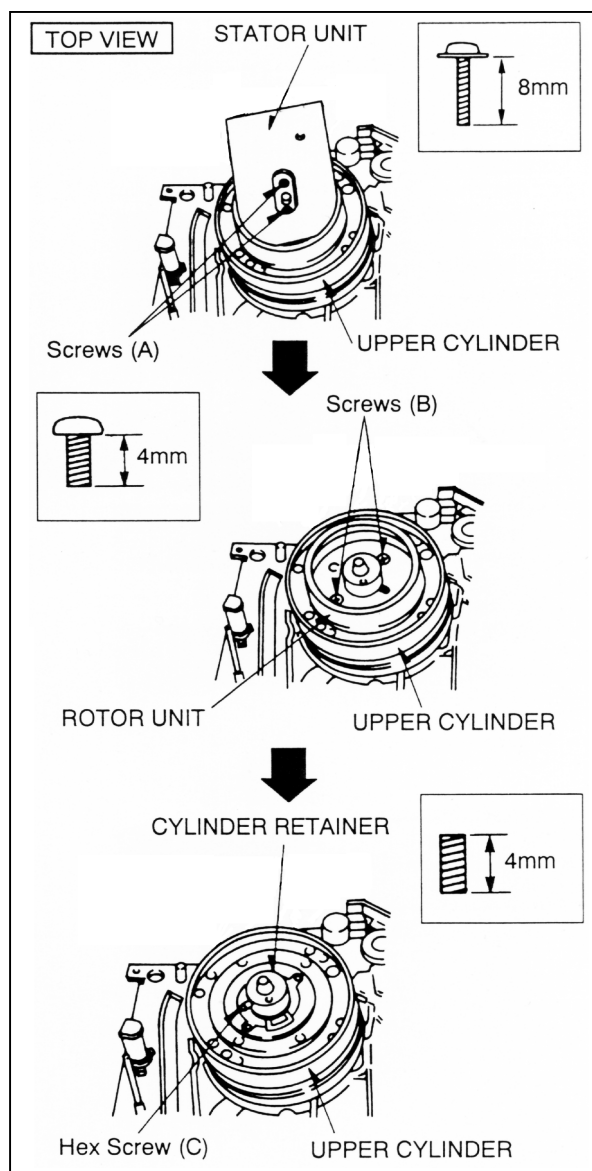
A. CYLINDER UNIT REPLACEMENT

Remove the 3 Screws (A) of the CYLINDER UNIT with a magnetized screw driver.



B. UPPER CYLINDER DISASSEMBLY

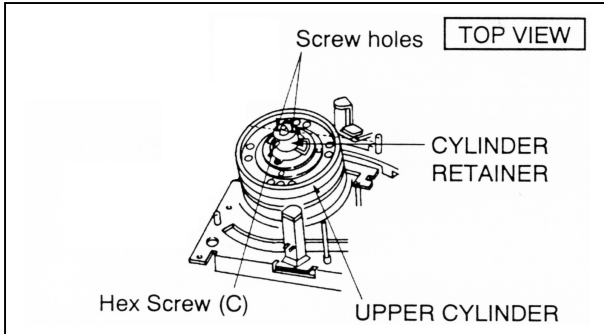
1. Remove 2 screws (A).
2. Remove the Cylinder Stator Unit.
3. Remove 2 screws (B).
4. Remove the Cylinder Rotor Unit.
5. Loosen hex screw (C) and remove the Cylinder Retainer. (Use Hex. Key Wrench 1.5 mm)
6. Remove the Upper Cylinder.



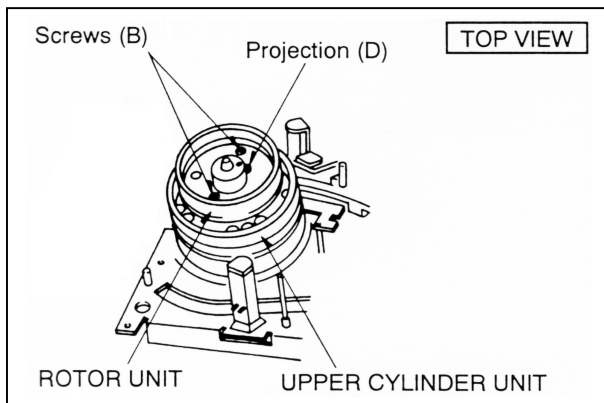
C. UPPER CYLINDER ASSEMBLY

For reassembling, perform the steps in the reverse order.

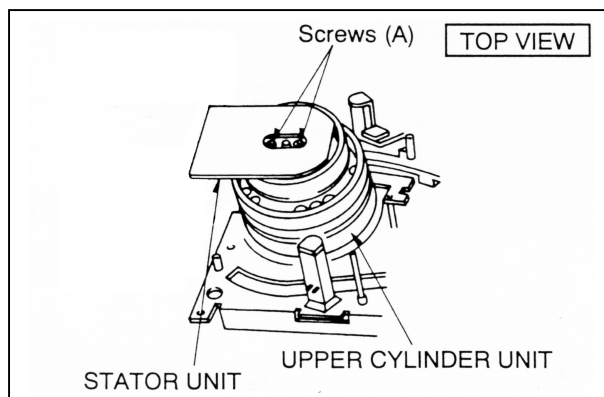
- 1) Install the Cylinder Retainer so that the 2 holes on top of the cylinder retainer are at right angles.
- 2) Tighten the hex screw (C) while pressing down on top of the Cylinder Retainer. (Use Hex. Wrench 1.5 mm)



- 3) Install the Cylinder Rotor Unit so that the inner hole of the Cylinder rotor Unit to the small projection (D) on top of the Upper Cylinder.
- 4) Tighten 2 screws (B).



- 5) Install the Cylinder Stator Unit.
- 6) Tighten 2 screws (A).



- 7) Confirm the PG SHIFTER ADJUSTMENT with the alignment tape (NTSC: VFM8080HQFP) and adjust it if necessary.

MECHANICAL ADJUSTMENT INFORMATION

This section contains the supplementary information of Mechanical Adjustment Procedure for Z-Mechanism. Please refer to the Z-Mechanism service manual (Order No. VSD9706M201, VRD9802005C2)

1. TEST POINT

INTERCHANGEABILITY ADJUSTMENT	VIDEO RF SIGNAL	TP3001 MAIN C.B.A.
	HEAD SWITCHING PULSE	TP6905 REAR JACK

2. SPECIFICATION

BACK TENSION	22.5 ~ 27.5g
--------------	--------------

SECTION 3

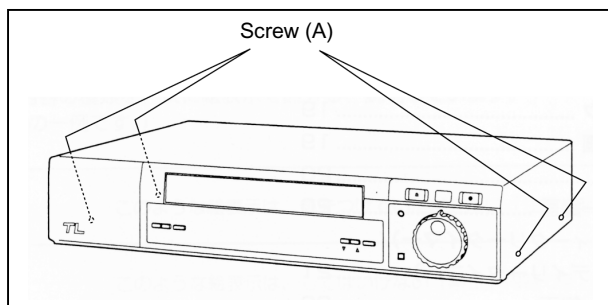
DISASSEMBLY PROCEDURES

CONTENTS

1.	Removal of The Top Cover	DIS-1
2.	Removal of The Front Panel	DIS-1
3.	Removal of The Power Supply C.B.A.....	DIS-1
4.	Removal of The Front R C.B.A.....	DIS-1
5.	Removal of The Front L C.B.A.	DIS-2
6.	Removal of The YC SEP C.B.A. (AG-RT650 only)	DIS-2
7.	Removal of Mechanism Unit and Main C.B.A.	DIS-2
8.	Removal of The Rear Jack C.B.A.....	DIS-3

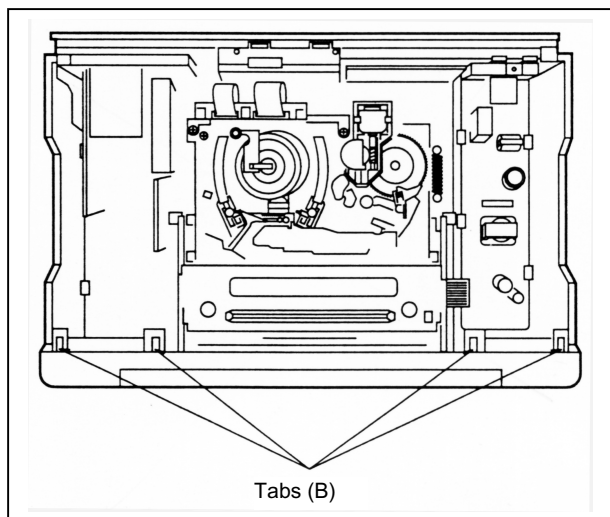
1. Removal of The Top Cover

1. Remove 4 screws (A) at left & right side.
2. Lift up rear portion and remove it.

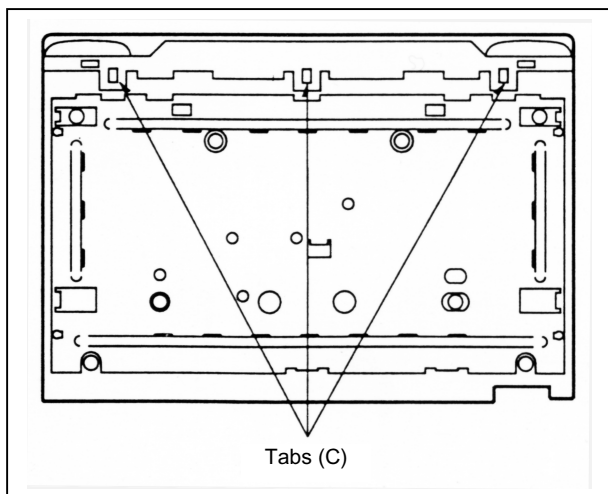


2. Removal of The Front Panel

1. Remove the Top Cover
2. Pull out the JOG dial knob to front direction. (AG-RT650 only)
3. Unlock 4 tabs (B) at top side.

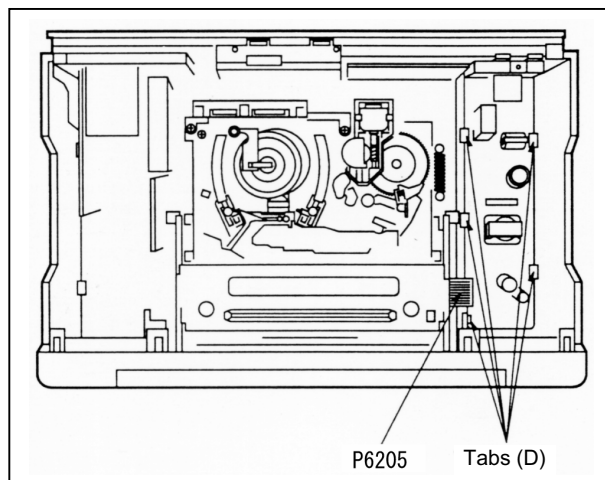


4. Unlock 3 tabs (C) at bottom side and remove it.



3. Removal of The Power Supply C.B.A.

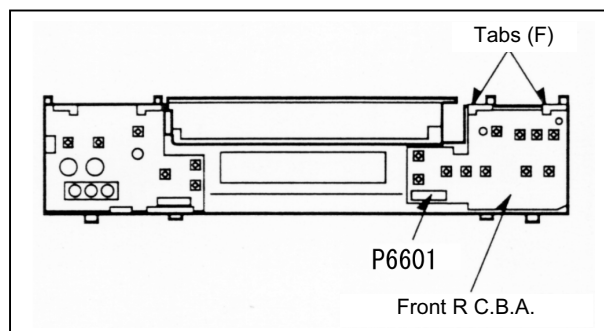
1. Remove the top Cover & the Front Panel.
2. Disconnect the Bridge connector (P6205)
3. Unlock 4 tabs (D)



4. Lift up the metal angle at rear portion and remove it.

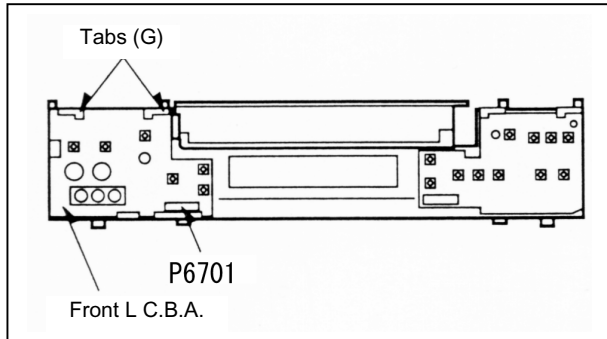
4. Removal of The Front R C.B.A.

1. Remove the top cover & Front Panel.
2. Unlock 2 tabs (F)
3. Disconnect a connector (P6601) from the Main C.B.A..



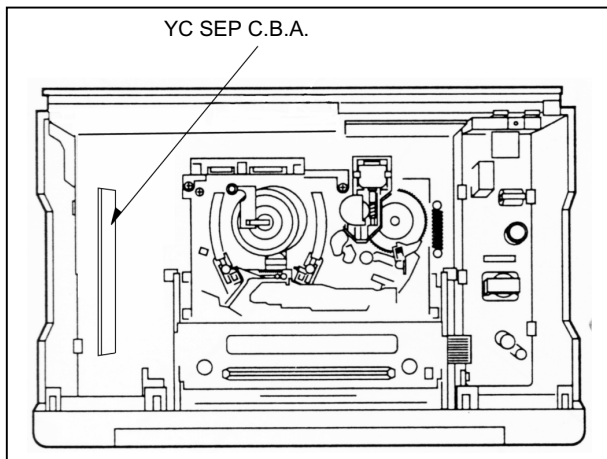
5. Removal of The Front L C.B.A..

1. Remove the top cover & Front Panel.
2. Unlock 2 tabs (G)
3. Disconnect a connector (P6701) from the Main C.B.A..



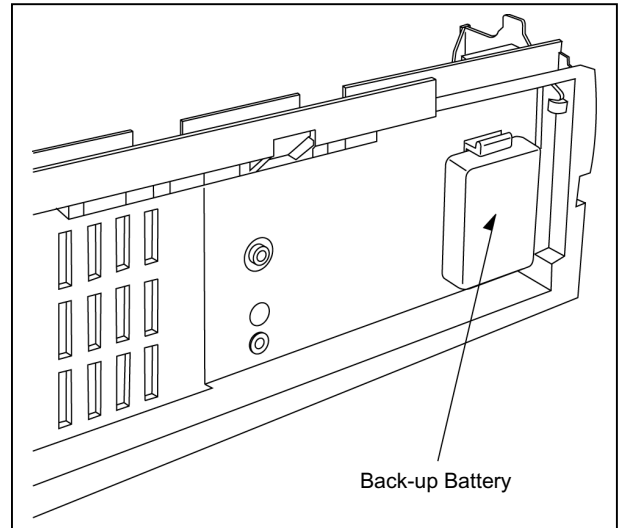
6. Removal of The YC SEP C.B.A.. (AG-RT650 only)

1. Remove the top cover & Front Panel.
2. Pull out the YC SEP C.B.A..

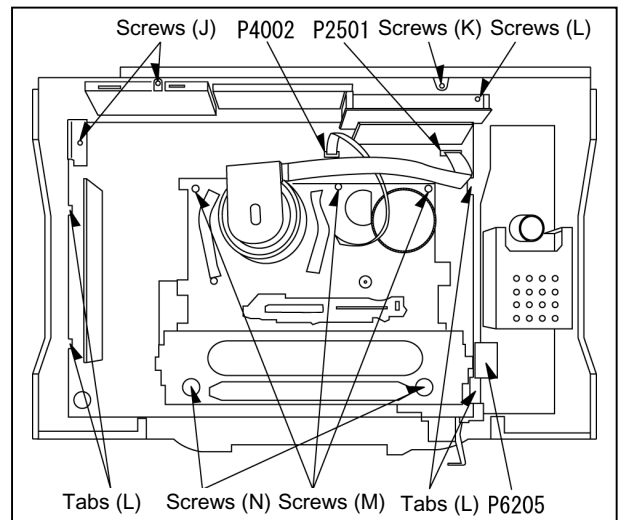


7. Removal of Mechanism Unit and Main C.B.A..

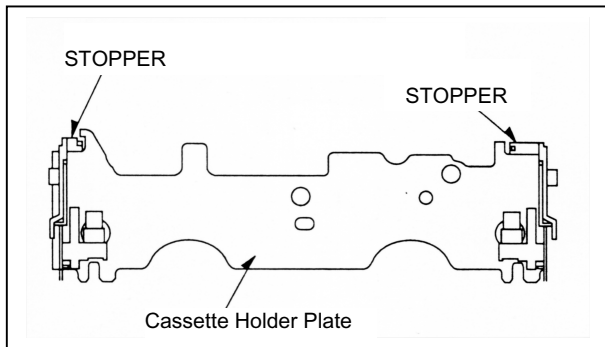
1. Remove the top cover & Front Panel.
2. Disconnect a connector (P6204) and remove the Back-up Battery.



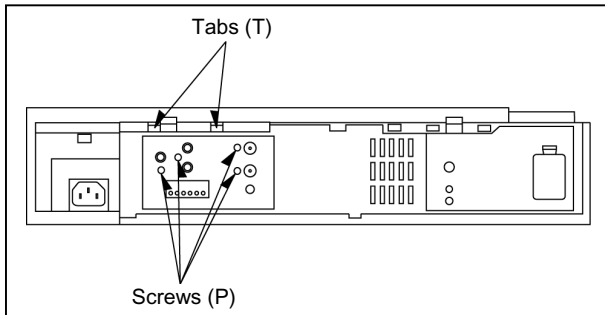
3. Disconnect the connector (P6205, P4002 and P2501).
4. Remove 2 screws (J), 3 screws (M), screw (K) and screw (L).



5. Keeping pressing 2 stoppers on the Cassette Holder Plate and press the Cassette Holder Plate to rear and remove 2 screws (N).

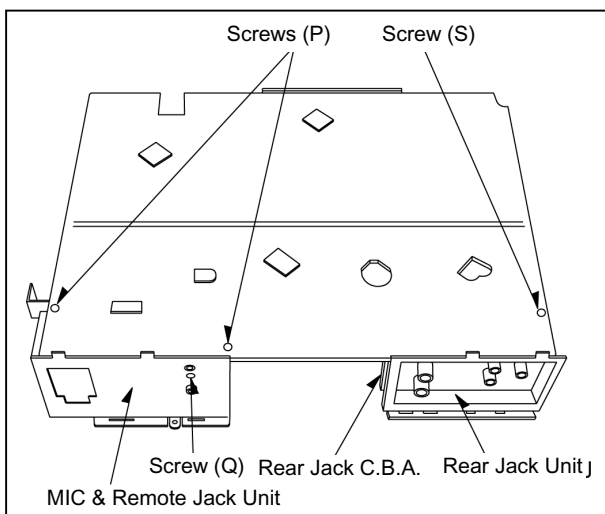


6. Remove 3 screws, then press the Earth Plate to rear.
7. Carefully lift up the Mechanism unit.
8. Unlock 4 tabs (L) and 2 tabs (T), then lift up the Main C.B.A and the both Rear Jack C.B.A..



8. Removal of The Rear Jack C.B.A.

1. Loosen a screw (Q) and remove 2 screws (R), then remove the MIC & Remote Jack unit from the Main C.B.A..

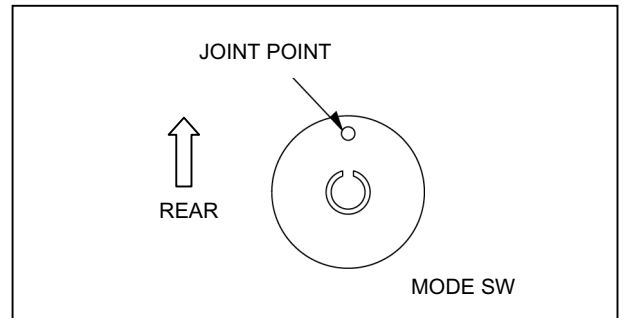


2. Remove a screw (S) and remove the Rear Jack unit from the Main C.B.A..

3. Remove 4 screws (P) and remove the Rear Jack C.B.A. from the Rear jack unit.

Note: Installation method of the Mechanism Unit.

- Confirm the MODE switch position as following figure.



- Make sure fit the CYLINDER cable, Loading Motor connector, FE Head connector, MODE switch and Supply & Take-up Photo unit on the Main C.B.A. to the Mechanism unit.

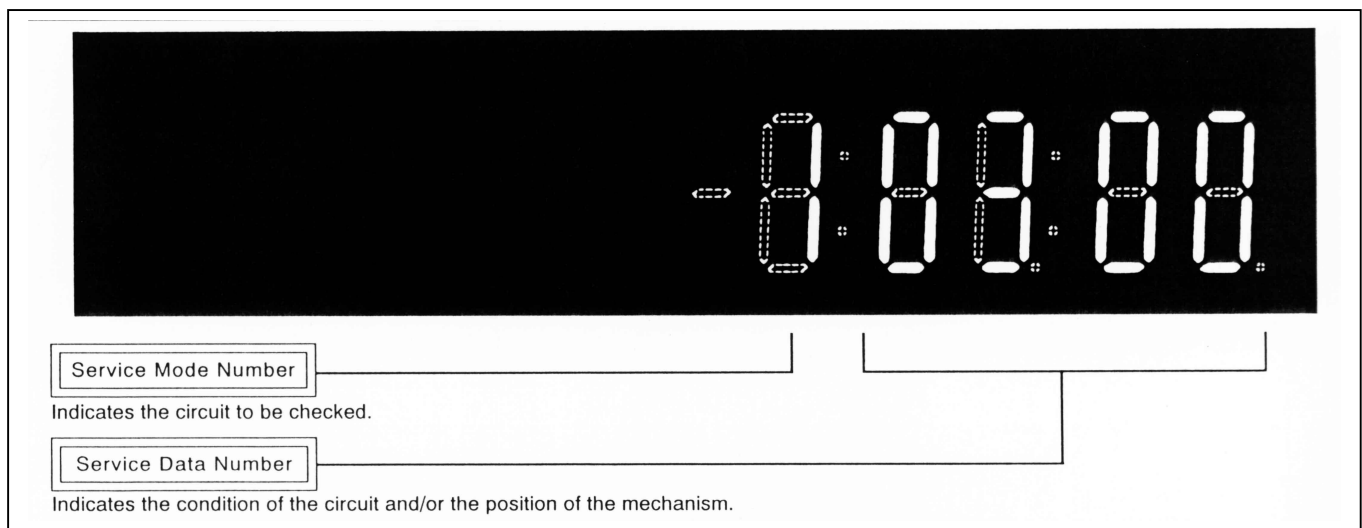
SECTION 2

SERVICE INFORMATION

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1-2. How to display Service Information	INF-1
1-3. Use of Service Modes	INF-1
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3. CHEKING OF MAIN C.B.A.	INF-6
4. REMOVAL OF CASSETTE TAPE	INF-6
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1. SERVICE INFORMATION DISPLAY



1-1. Purpose of Service Information Display

This is information to aid trouble shooting by indicating the source of the malfunction. The service mode number & service data number are used by the technician for repair.

1-2. How to display Service Information

Press the FF and EJECT buttons simultaneously.

In the service Information display, there are five digit numbers divided into 3 functions.

The first digit indicates service mode that the unit is currently in.

MODE 1: Check tape protection circuit.

MODE 2: Check tape transport mechanism.

MODE 3: Indicate the most recent fault indication code.

MODE 4: Indicate the second recent fault indication code.

MODE 5: Indicate the third recent fault indication code.

MODE 6: Check cylinder motor and capstan motor.

MODE 7: Check loading/unloading mechanism action.

The second, third, fourth and fifth digits are service data 1 and 2 which indicate the condition of the circuit or mechanism.

1-3. Use of Service Modes

(1) Show Service Information Display.

(2) To change Service modes, press the FF and EJECT buttons simultaneously.

(3) Mode 0: Indicate VCR mode and process number

(4) Mode 1:

Service Data 1: Checks the sensor LED, Supply & Take-up sensor circuits by blocking the light from the sensor LED to either or both Supply & Take-up sensor.

When the light is blocked to both sensors, "00" should be indicated on the service data number.

When the light is blocked to the supply sensor, "01" should be indicated.

Service Data 2: Indicate the code if the microprocessor receives the operating commands from the mode buttons and/or remote controller.

(5) Mode 2:

Service Data 1: Check the mode switch circuit while indicating mechanism position.

Service Data numbers indicate the position of the mode switch as the mechanism position.

Service Data 2: Indicate control command to cylinder unit, capstan unit and loading motor unit.

(6) Mode 3:

Service Data 1: The most recent fault indication code is displayed.

Service Data 2: Indicate complementary data (VCR mode, mechanism position and so on) for the most recent fault indication code.

(7) Mode 4:

Service Data 1: The second recent fault indication code is displayed.

Service Data 2: Indicate complementary data (VCR mode, mechanism position and so on) for the most recent fault indication code.

(8) Mode 5:

Service Data 1: The third recent fault indication code is displayed.

Service Data 2: Indicate complementary data (VCR mode, mechanism position and so on) for the most recent fault indication code.

(9) Mode 6:

Service Data 1: Check cylinder motor circuit.

Indicate if the system control IC has received the command to rotate the cylinder motor.

Service Data 2: Check capstan motor circuit.

Indicate if the system control IC has received the command to rotate the cylinder motor.

(10) Mode 7: Check the loading/unloading mechanism action.

The loading motor rotates for loading when the "PLAY" button is pressed.

The loading motor rotates for unloading when the "STOP" button is pressed.

This mode can be displayed until the POWER button is pressed.

Service Mode Number	Note for checking Service Data Numbers	Service Data 1		Service Data 2		Remarks
		Service Data Numbers	Indication	Service Data Numbers	Indication	
1	Service Data 1: For checking supply/ Take-up photo sensor. Service Data 2: For checking operating button.	00 01 02 03	No light detected at either sensor Tape beginning Light to Supply photo sensor is blocked. Tape end Light to Take-up photo sensor is blocked. Light detected at both sensors.	-----	Display only when the operating button is pressed.	Tape not required.
2	Service Data 1: For checking mechanism mode position. Service Data 2: For checking cylinder, capstan and loading motor.	00 01 02 03 04 05 06 07	EJECT Cassete down REV, REV SLO Loading/Unloading PLAY, REC, STILL, PAUSE, CUE FWD SLOW, STOP3*1 STOP*2 FF/REW Intermediated position	0*, 2* 1* 3* 8*, A* 9* B* *0 *1 *2 *3	Cylinder OFF, Capstan OFF Cylinder OFF, Capstan ON (FWD) Cylinder OFF, Capstan ON (RVS) Cylinder ON, Capstan OFF Cylinder ON, Capstan ON (FWD) Cylinder ON, Capstan ON (RVS) Mode OFF Loading Unloading Break (loading + unloading) Note: Left digit indicates cylinder and capstan unit condition, Right digit indicates loading motor condition.	Tape required. *1. STOP3: Pinch roller is on Capstan motor shaft. *2. STOP: Pinch roller is off Capstan motor shaft. To enable mechanism operation without cassette tape, the following detection is not worked. -supply and Take-up sensor. -Reel lock. -Distinction and position of tape.
3	Service Data 1: Indicates the most recent fault indication code (Self-test indication display). Service Data 2: Indicates complementary data (VCR mode, mechanism position mode and so on) for fault indication code.	10 11 01 02 03 04 05 06 07 08 15 16 17 18 2*	Dew formation. Cylinder clogs during PLAY mode. After cylinder lock is detected, the cylinder does not start rotating again even after tape unloading. Cassette tape is not wound up during tape unloading except EJECT mode. Mechanism locks during mode transition except EJECT mode. Mechanism locks during tape loading. Cassette tape is not wound up during tape unloading in EJECT mode. Mechanism locks after tape unloading in EJECT mode. During recording mode recording signal is less than the normal condition. Recording circuit works except recording mode. Tape is not loading in cassette in mode. Cylinder lock detection. Supply reel mechanism lock detection. Take-up reel mechanism lock detection. PG shifter automatic adjustment error.	8 Left digit Right digit * Left digit Right digit 0 Left digit Right digit	Left digit: Indicates VCR mode. 0:STOP, 1:EJECT, 2:REW, 3:FF, 4:REV, 5:CUE, 6:SLOW, 7:POWER OFF, 8:PLAY, 9:STILL, A:REC, B:REC PAUSE, C:ADUB, D:ADUB PAUSE, E:INSERT, F:INSERT PAUSE Right digit: Tape position, waiting mode position and supply reel pulse counting value are indicated. Fault indication number 03, 04, 06: Indicates waiting mechanism position. Fault indication number 05, 16, 17, 18: Indicates tape position that is indicated in hexadecimal. Fault indication number 15: Indicates supply reel pulse counting value. The other fault indication codes :No display.	

Service Mode Number	Note for checking Service Data Numbers	Service Data 1		Service Data 2		Remarks	
		Service Data Numbers	Indication	Service Data Numbers	Indication		
4	Service Data 1: Indicate the second recent fault indication code (Self-test indication display). Service Data 2: Indicate complementary data (VCR mode, mechanism position mode and so on) for fault indication code.	10	Dew formation	8 Left digit	* Right digit	Left digit: Indicates VCR mode. 0:STOP, 1:EJECT, 2:REW, 3:FF, 4:REV, 5:CUE, 6:SLOW, 7:POWER OFF, 8:PLAY, 9:STILL, A:REC, B:REC PAUSE, C:ADUB, D:ADUB PAUSE, E:INSERT, F:INSERT PAUSE	
		11	Cylinder clogs during PLAY mode.				
		01	After cylinder lock is detected, the cylinder does not start rotating again even after tape unloading.				
		02	Cassette tape is not wound up during tape unloading except EJECT mode.	* Left digit	0 Right digit	Right digit: Tape position, waiting mode position and supply reel pulse counting value are indicated. Fault indication number 03, 04, 06: Indicates waiting mechanism position. Fault indication number 05, 16, 17, 18: Indicates tape position that is indicated in hexadecimal. Fault indication number 15: Indicates supply reel pulse counting value. The other fault indication codes :No display.	
		03	Mechanism locks during mode transition except EJECT mode.				
		04	Mechanism locks during tape loading.				
05	Cassette tape is not wound up during tape unloading in EJECT mode.						
5	Service Data 1: Indicate the third recent fault indication code (Self-test indication display). Service Data 2: Indicate complementary data (VCR mode, mechanism position mode and so on) for fault indication code.	06	Mechanism locks after tape unloading in EJECT mode.				
		07	During recording mode recording signal is less than the normal condition.				
		08	Recording circuit works except recording mode.				
		15	Tape is not loading in cassette in mode.				
		16	Cylinder lock detection.				
		17	Supply reel mechanism lock detection.				
		18	Take-up reel mechanism lock detection.				
2*	PG shifter automatic adjustment error.						
6	Service Data 1: For checking cylinder unit. Service Data 2: For checking capstan unit. Left digit only, disregard right digit display.	1 Left digit	0 Right digit	1, 3, 5, 7, 9, A, n, and no display indicate that the cylinder motor "ON" command received by system control microprocessor.	8 Left digit	1 Right digit	8, 9, u, A, -, n, L and no display indicate that the capstan motor "PLAY" command received by system control microprocessor. 1, 2, 3, 4, 5, 6, 7 display indicate that the capstan motor "PLAY" command received by system control microprocessor. 8, 9, u, A, -, n, L and no display indicate that the capstan motor "RVS, REW, RVS SLOW" command received by system control microprocessor.
	Service Data 1: Not used. Service Data 2: For checking capstan unit. Right digit only, disregard left digit display.	----	----	8 Left digit	7 Right digit		
	Service Data 1: Not used. Service Data 2: For checking capstan unit. Right digit only, disregard left digit display.	----	----	8 Left digit	- Right digit		
7	Same as mode 2.	Same as Mode 2.		Same as Mode 2.			

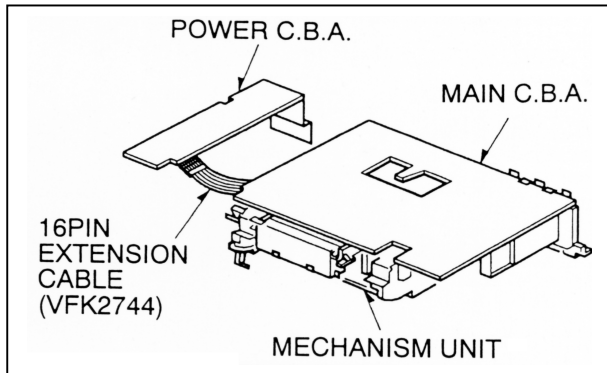
2. AUTO OFF AND ERROR MESSAGE

ERROR CODE	CONTENS	CAUSE CONDITION
d	CONDENSATION (DEW)	<ol style="list-style-type: none"> 1. If it is in POWER OFF mode, the mode turns to POWER ON and "d" blink indication. 2. If a tape is inserted, the mode turns to half EJECT position and cylinder rotates. 3. Dew condensation continues for about 80 minutes. 4. After released from condensation, if a tape is inserted, the mode turns to STOP.
E-2	FRONT LOADING LOCKED	<ol style="list-style-type: none"> 1. If the motor is locked for about 2-5 seconds during front loading, it is unloaded. 2. After above item1 if it is locked for about 2-5 seconds again, the mode turns to AUTO OFF and "E-2" indication.
E-3	LOADING LOCKED	<ol style="list-style-type: none"> 1. If the motor is locked for about 5 seconds during loading, it is unloaded. Then if it is loaded and locked again, the mode turns to AUTO OFF and "E-3" indication. 2. If the motor is locked for about 2-5 seconds during unloading, the mode turns to AUTO OFF and "E-3" indication.
E-4	CYLINDER LOCKED	<ol style="list-style-type: none"> 1. If the motor is locked for about 5 seconds in cylinder rotating mode, the mode turns to AUTO OFF and "E-4" indication.
E-5	REEL LOCKED	<ol style="list-style-type: none"> 1. If the reel rotation is locked during tape running, the motor in unloaded once. Then if the rotation is locked through the trying to load, the mode turns to AUTO OFF and "E-5" indication.

NTSC				PAL			
T-MODE	MODE	TAPE SPEED	DET. TIME	T-MODE	MODE	TAPE SPEED	DET. TIME
	PLAY	± 1	3.5S		PLAY	± 1	3.5S
8H	CUE/REV	± 2.5	1.6S	3H	CUE/REV	± 2.5	1.6S
	CUE/REV	$\pm 11,21,27$	0.3S		CUE/REV	$\pm 7,9,11$	0.3S
24H	PLAY	± 1	21S		PLAY	± 1	3.5S
40H	PLAY	± 1	42S	6H	CUE/REV	± 2.5	1.6S
					CUE/REV	$\pm 11,15,17,19$	0.3S
				12H	PLAY	± 1	21S
				24H	PLAY	± 1	42S

3. CHECKING OF MAIN C.B.A.

When Servicing the MAIN C.B.A., take out the MAIN C.B.A. and mechanism from the frame and turn over, and then connect Extension Cable (VFK2744) between the POWER C.B.A. connector and the MAIN C.B.A. connector as shown in below.



4. REMOVAL OF CASSETTE TAPE

There are 2 ways to remove a cassette tape.

4-1. Removal of compulsory loading.

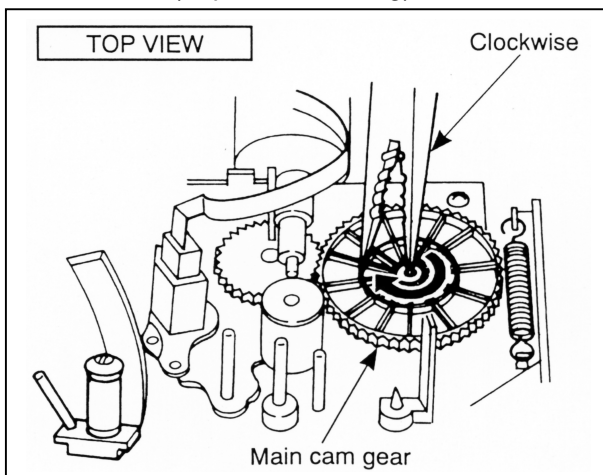
- 1) Press FF and EJECT buttons simultaneously and set the service mode 7.
- 2) Press STOP button in order to unload the mechanism
(Pay an attention to tape slack)

Service Mode Indication:

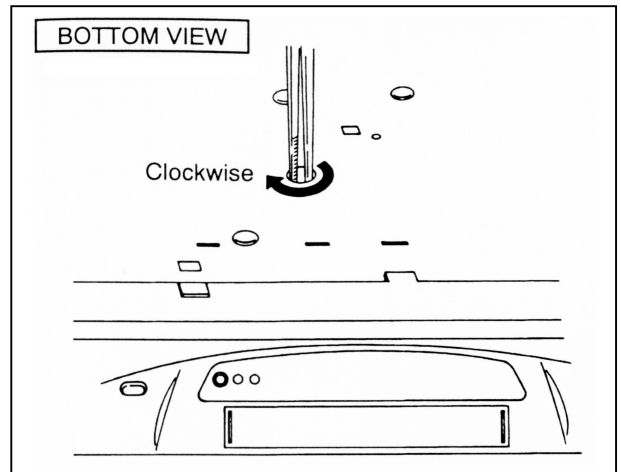
7 ※ ※ ※ ※ (STOP) → 7 00 ※ ※ (EJECT)

4-2. Removal of manual operation of Main cam gear.

- 1) Disconnect the AC power cord and remove Top Panel.
- 2) Rotate Main cam gear clockwise and unload the mechanism (Tape as remaining)



- 3) Rotate the Pole of Capstan motor to the clockwise the from the bottom in order to remove the tape slack.



- 4) Rotate Main cam gear clockwise in order to eject the cassette tape.

5. HOUR METER RESET

1. Turn OFF power.
2. Connect the jumper wire between TP6902 and TP6901 on the Rear Jack C.B.A.
3. Set the MENU/REC LOCK switch to REC LOCK side.
4. Pressing the TRACKING and TRACKING buttons simultaneously, then turn ON power.
5. Confirm the Time display starts to blink.
6. The hour meter reset function is completed when stop the display blinking.

SECTION 1

OPERATING INSTRUCTIONS

CONTENTS

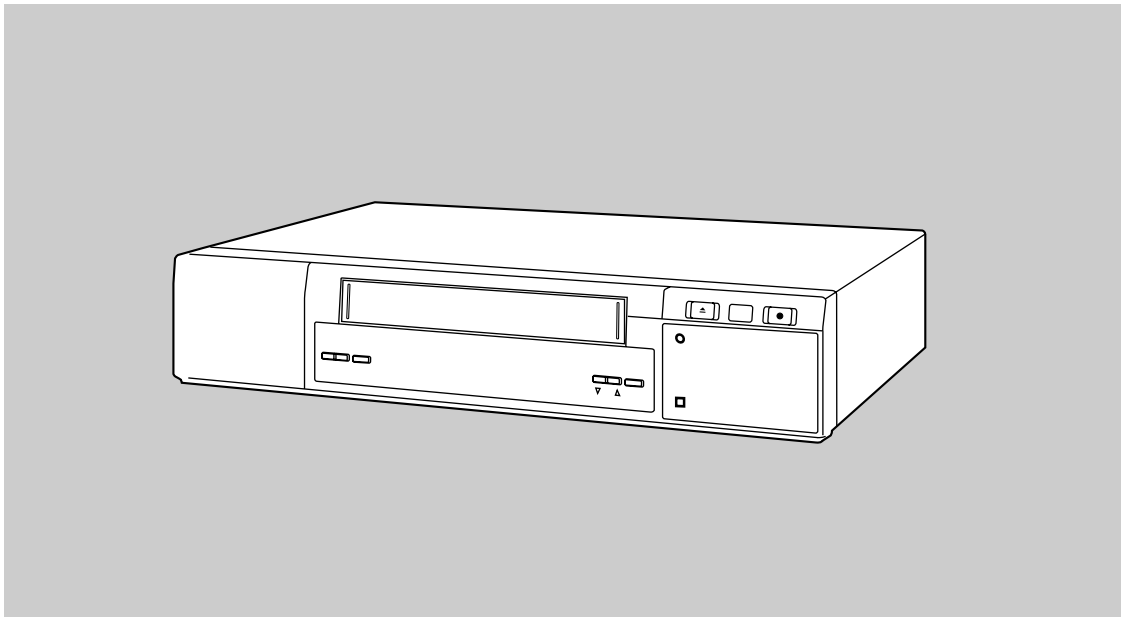
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Operating Instructions



Time Lapse Recorder

Model AG-**TL350**_{BE}



Panasonic

Before attempting to connect, operate or adjust this product, please read these instructions completely.

Caution for AC Mains Lead

FOR YOUR SAFETY PLEASE READ THE FOLLOWING TEXT CAREFULLY.

FOR U.K. ONLY

This appliance is supplied with a moulded three pin mains plug for your safety and convenience.

A 5 amp fuse is fitted in this plug.

Should the fuse need to be replaced please ensure that the replacement fuse has a rating of 5 amps and that it is approved by ASTA or BSI to BS1362.

Check for the ASTA mark  or the BSI mark  on the body of the fuse.

If the plug contains a removable fuse cover you must ensure that it is refitted when the fuse is replaced.

If you lose the fuse cover the plug must not be used until a replacement cover is obtained.

A replacement fuse cover can be purchased from your local Panasonic Dealer.

IF THE FITTED MOULDED PLUG IS UNSUITABLE FOR THE SOCKET OUTLET IN YOUR HOME THEN THE FUSE SHOULD BE REMOVED AND THE PLUG CUT OFF AND DISPOSED OF SAFELY.

THERE IS A DANGER OF SEVERE ELECTRICAL SHOCK IF THE CUT OFF PLUG IS INSERTED INTO ANY 13 AMP SOCKET.


If a new plug is to be fitted please observe the wiring code as shown below.

If in any doubt please consult a qualified electrician.

IMPORTANT: The wires in this mains lead are coloured in accordance with the following code:

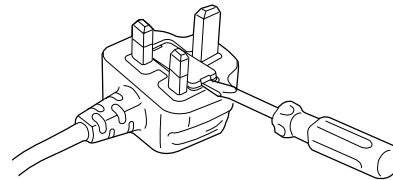
Blue:	Neutral
Brown:	Live

As the colours of the wires in the mains lead of this appliance may not correspond with the coloured markings identifying the terminals in your plug, proceed as follows:

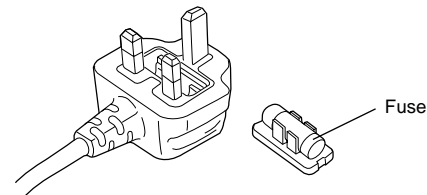
- The wire which is coloured BLUE must be connected to the terminal in the plug which is marked with the letter N or coloured BLACK.
- The wire which is coloured BROWN must be connected to the terminal in the plug which is marked with the letter L or coloured RED.
- Under no circumstances should either of these wires be connected to the terminal in the plug which is marked with the letter E or by the Earth symbol .

How to replace the fuse

1. Open the fuse compartment with a screwdriver.



2. Replace the fuse.



■ DO NOT REMOVE PANEL COVER BY UNSCREWING.

To reduce the risk of electric shock, do not remove cover. No user serviceable parts inside. Refer servicing to qualified service personnel.

- If the unit is not going to be used for a length of time, turn the unit to STANDBY mode and disconnect the power plug from the AC outlet.

WARNING:

TO REDUCE THE RISK OF FIRE OR SHOCK HAZARD, KEEP THIS EQUIPMENT AWAY FROM ALL LIQUIDS-USE AND STORE ONLY IN LOCATIONS WHICH ARE NOT EXPOSED TO THE RISK OF DRIPPING OR SPLASHING LIQUIDS, AND DO NOT PLACE ANY LIQUID CONTAINERS ON TOP OF THE EQUIPMENT.

CAUTION:

TO REDUCE THE RISK OF FIRE OR SHOCK HAZARD AND ANNOYING INTERFERENCE, USE THE RECOMMENDED ACCESSORIES ONLY.

CAUTION:

Do not install or place this unit in a bookcase, built in cabinet or in another confined space in order to keep well ventilated condition. Ensure that curtains and any other materials do not obstruct the ventilation condition to prevent risk of electric shock or fire hazard due to overheating.

Lithium Battery

Warning

The lithium battery in this equipment must only be replaced by qualified personnel. When necessary, contact your local Panasonic supplier.

"The lithium battery is a critical component (type number VL2330/1HF manufactured by Panasonic.)

It must never be subjected to excessive heat or discharge. It must therefore only be fitted in equipment designed specifically for its use.

Replacement batteries must be of the same type and manufacturer. They must be fitted in the same manner and location as the original battery, with the correct polarity connections observed.

Do not attempt to re-charge the old battery or re-use it for any other purpose. It should be disposed of in waste products destined for burial rather than incineration."

CAUTION

Danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the equipment manufacturer. Discard used batteries according to manufacturer's instructions.

VARNING

Explosionsfara vid felaktigt batteribyte. Använd samma batterityp eller en ekvivalent typ som rekommenderas av apparattillverkaren. Kassera använt batteri enligt fabrikantens instruktion.

ADVARSEL

Eksplosionsfare ved fejlagtig håndtering. Udskiftning må kun ske med batteri af samme fabrikat og type. Levér det brugte batteri tilbage til leverandøren.

VAROITUS

Paristo voi räjähtää, jos se on virheellisesti asennettu. Vaihda paristo ainoastaan laitevalmistajan suosittelemaan tyyppiin. Hävitä käytetty paristo valmistajan ohjeiden mukaisesti.

Attention/Attentie

A battery is used for memory-backup in the unit. When the battery is exhausted, you should not throw it away, but dispose of it as small chemical waste.

Voor het reservegeheugen van het apparaat wordt gebruikgemaakt van een batterij. Wanneer de batterij is uitgeput, mag u deze niet gewoon weggooien, maar dient u deze als klein chemisch afval weg te doen.

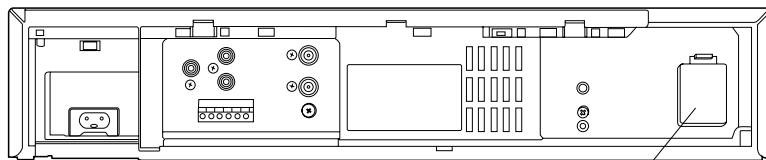
Removing the battery/Verwijderen van de batterij

Battery for memory-backup (lithium battery)/

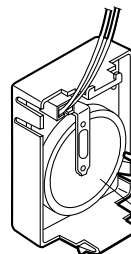
Batterij voor reservegeheugen (lithiumbatterij)

Remove the battery from the unit.

Verwijder de batterijhouder uit het apparaat.



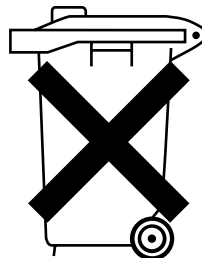
Battery holder/
Batterijhouder



Lithium battery/Lithiumbatterij

To replace the battery, please consult your local dealer.

Voor het vernieuwen van de batterij dient u uw plaatselijke handelaar te raadplegen.



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- Do not insert fingers or any objects into the video cassette holder.
- Avoid operating or leaving the unit near strong magnetic fields. Be especially careful of large audio speakers.
- Avoid operating or storing the unit in an excessively hot, cold, or damp environment as this may result in damage both to the recorder and to the tape.
- Do not spray any cleaner or wax directly on the unit.
- If the unit is not going to be used for a length of time, protect it from dirt and dust.
- Do not leave a cassette in the recorder when not in use.
- Do not block the ventilation slots of the unit.

- Use this unit horizontally and do not place anything on the top panel.
- Cassette tape can be used only for one-side, one direction recording. Two-way or two-track recordings cannot be made.
- Cassette tape can be used for either Colour or Black & White recording.
- Do not attempt to disassemble the recorder. There are no user serviceable parts inside.
- If any liquid spills inside the recorder, have the recorder examined for possible damage.
- Refer any needed servicing to authorized service personnel.

Features

Recording and playback up to 24-hour time modes

In addition to the 3-hour/6-hour time modes, recording and playback can be performed in the time lapse modes (12-hour, 24-hour modes).

Full line-up of recording functions

Included in the wide range of recording functions are restoration-of-power-after-failure recording, recording every day and by the days of the week using the internal timer, external timer recording, alarm recording, emergency recording and repeat recording.

Playback functions

Among the convenient playback functions are the recording review function for immediate viewing of recorded material, the handy search function for locating images promptly, and the forward/reverse field advance and still-picture functions for careful viewing of particular scenes.

Auto tracking function

The tracking can be automatically adjusted by pressing the “-” and “+” tracking buttons together.

Built-in time/date generator

This unit comes with a built-in microprocessor with a calendar function for displaying the time on the display or TV monitor and for controlling the time of the internal timer.

Recording lock function

A double recording mode lock function is provided for safeguarding against operational errors during recording.

Connection to frame switcher

Easy connection to a frame switcher is possible once the unit has been connected to the video input and camera SW connectors.

- Do not supply signals from colour cameras and black-and-white cameras simultaneously to the camera input connectors since this may disturb the synchronization on the monitor screen or generate noise.

Hour meter

The unit contains an hour meter which provides useful information for maintenance and inspections.

Remote control

The unit can be operated from a distance of about 5 meters if the AG-A11 remote controller, available as an optional accessory, is connected.

IMPORTANT

“Unauthorized recording of copyrighted television programmes, films, video tapes and other materials may infringe the right of copyright owners and be contrary to copyright laws.”

Regular Maintenance Service Recommendation

Although this unit is designed to withstand long-term use, the items listed below should be inspected regularly so that the unit is kept in perfect working order. Use the hour meter to know when to conduct the inspections.

The VTR is a piece of precision-made equipment and, as such, it is recommended that the user enter into a maintenance and inspection agreement to keep the unit operating free of trouble or failures. For further details, please consult with your dealer.

Cumulative operation time (hours)	500	1000	1500	2000	2500	3000	3500	4000	8000	12000
Inspection item										
Transport system cleaning	●	●	●	●	●	●	●	●	●	●
Audio heads	●	●	●	●	●	●	●	●	●	◎
Video heads	●	●	●	●	●	●	●	◎	◎	◎
Cylinder unit	●	●	●	●	●	●	●	●	●	◎

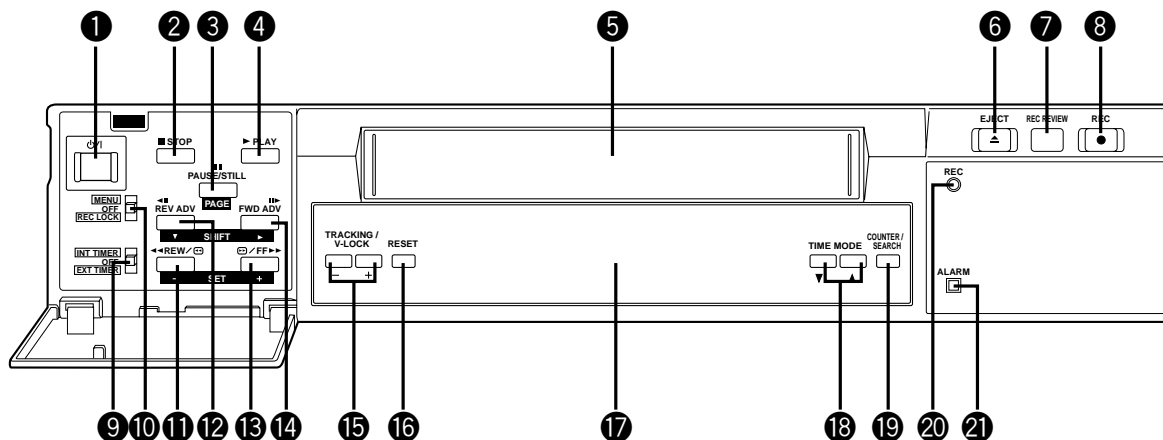
◎ Service life inspection

● Cleaning

(12-/24-hour mode use)

The above table merely serves to lay down general guidelines for the inspection of typical parts involved in regular inspections. The timing of the inspections needs to be adjusted according to the VTR's operating environment.

Parts And Their Functions



① **⏻/⏻ (STANDBY/ON) switch**

The unit is turned on when this switch is pressed. When the switch is pressed again, the unit is in standby mode.

② **STOP button**

When this is pressed, the tape stops travelling.

③ **PAUSE/STILL (PAGE) button**

When this is pressed during recording, the tape temporarily stops travelling. When pressed during playback, the tape temporarily stops travelling, and a still picture appears on the TV monitor. When pressed again, the tape travel resumes. The pages on the menu screen are advanced when the button is pressed while a menu screen is displayed.

④ **PLAY button**

Playback starts when this button is pressed.

⑤ **Cassette holder**

This is the loading slot for the video cassette.

⑥ **EJECT button**

This is used to eject the video cassette.

⑦ **REC REVIEW button**

When the button is pressed during recording, the tape runs temporarily in the reverse direction, and after the recorded section has been played back, the unit is returned to the recording mode.

⑧ **REC button**

Recording starts when this button is pressed.

⑨ **TIMER MODE switch**

This is the operation switch for internal timer recording or external timer recording. The displays shown below light on the display panel.

INT TIMER: At the times set by the internal timer, the power is automatically turned on or off and recording starts or stops.

OFF: When timer recording is not performed.

EXT TIMER: When the external power is turned on, recording starts automatically.

⑩ **MENU/REC LOCK switch**

When this switch is set to REC LOCK, the time mode and operation buttons as well as the power switch cannot be operated while recording is in progress.

When it is set to MENU, the menu screen appears.

⑪ **REW (SET -) button**

When this button is pressed, the tape is rewound. When it is kept depressed during playback, the review mode is established.

When it is pressed once during playback in the alarm search mode, the unit is placed in the review mode.

When a menu screen is displayed, it is used to change an item (decrement a value).

⑫ **Field REV ADV (SHIFT ▼) button**

When this is kept depressed during still-picture playback, the picture is advanced field by field in the reverse direction. When it is released, the still picture reappears.

When it is pressed while a menu screen is displayed, the setting items move downward.

⑬ **FF (SET +) button**

When this is pressed, the tape is fast forwarded. When it is kept depressed during playback, the unit is placed in the cue mode.

When it is pressed once during playback in the alarm search mode, the unit is placed in the cue mode.

When a menu screen is displayed, it is used to change an item (increment a value).

⑭ **Field FWD ADV (SHIFT ►) button**

When this is kept depressed during still-picture playback, the picture is advanced field by field in the forward direction. When it is released, the still picture reappears. When it is pressed while a menu screen is displayed, the setting items move toward the right.

15 Tracking (–, +) buttons/V-LOCK buttons

These buttons are used to adjust the tracking or to compensate the vertical dancing during still picture. If noise appears on the playback picture, press the buttons to adjust the tracking is such a way that the picture is made as clear as possible. When both buttons are pressed together during 3- or 6-hour mode playback, the tracking is adjusted automatically.

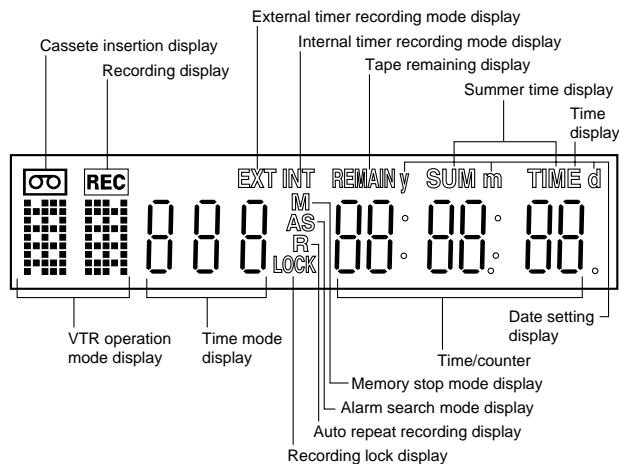
If the image shakes slightly in the vertical direction during still picture, press the V-LOCK buttons to reduce the dancing.

Further, the time/date display position can be adjusted during STOP and EJECT (see page 13).

16 RESET button

When this button is pressed, the counter display is reset to 0:00:00.

17 Display panel



- Operation mode displays

Operation mode	Display
Playback	▶▶ or ▶
Recording	▶ Rec lamp lights.
Still picture	□□
Recording pause	□□ Rec lamp lights.
Recording check	▶ Rec lamp lights.
Fast forwarding	▶▶▶
Rewinding	◀◀
Cue	▶▶▶
Review	◀◀
Forward field advance	□□ or □▶ (Flashing)
Reverse field advance	□□ or ◀□ (Flashing)

- Error messages
An error code appears when trouble has occurred during operation.
E-2: Trouble in video cassette insertion area
E-3: Trouble in video cassette tape loading area
E-4: Trouble in cylinder area
E-5: Trouble in tape transport area
d: Formation of condensation (dew)

18 TIME MODE (▼, ▲) buttons

These buttons are used to select the recording and playback time mode. Each time this is pressed, the time mode changes in the following sequence:

3H ↔ 6H ↔ 12H ↔ 24H

19 COUNTER/SEARCH selector button

When this button is pressed, the display on the display panel changes to time, counter, counter memory, alarm search and number of repeat recording times. The M mark appears on the display panel in the counter memory mode. When the tape is fast forwarded or rewound in this mode, the counter will automatically stop when 0:00:00 is approached. The AS mark appears on the display panel in the alarm search mode. When the tape is fast forwarded or rewound in this mode, the unit is automatically set to still-picture playback at the alarm recording section. If the FF button or REW button is pressed during playback with alarm search, the search will lock. (If this button is pressed while the tape is being fast forwarded or rewound, counter memory and alarm search will not function.)

“** PAS” is displayed during repeat recording.

“__PAS” appears at all other times.

(where “**” denotes the number of repeat times)

20 REC display lamp

This lamp lights while recording is in progress. It goes off when recording has finished.

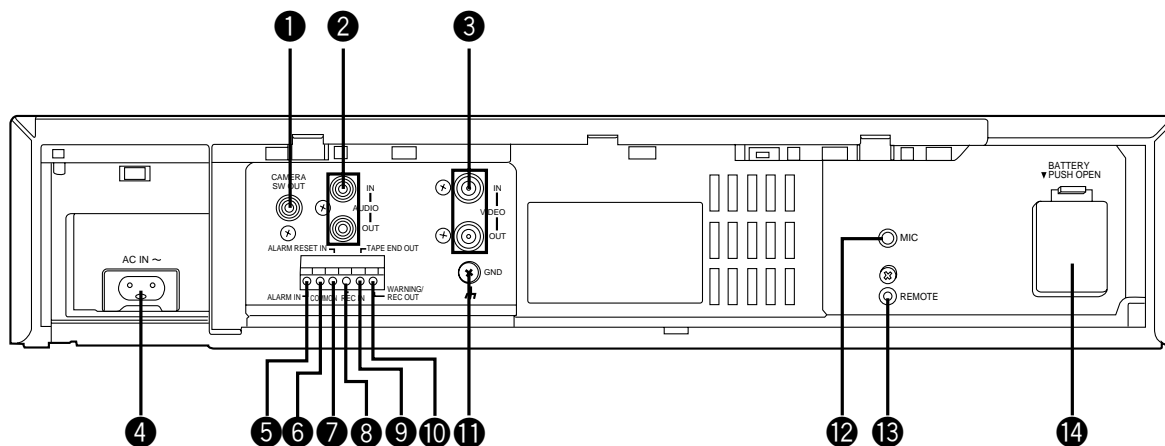
21 ALARM display lamp

This remains lighted while alarm recording is in progress. It flashes when alarm recording ends.

For Swedish and Danish Customers

- Aven om denna omkopplare är i “⏏”-läge, gar fortfarande en del av apparaten nätspänning.
- Selv om denne omskifter er i “⏏” stilling, tilføres en del af apparatet stadig strøm.

Parts And Their Functions



① Camera switching output connector

Camera switching output connector; connect it to the frame switcher.

② Audio input/output connectors

Audio input/output connectors (phono jacks)

③ Video input/output connectors

Video input/output connectors (BNC); connect the input connector to the video camera, etc. and the output connector to the TV monitor, etc.

④ AC IN connector

Connect the supplied power cord to an AC outlet.

⑤ Alarm input connector

Alarm recording input connector; connect it to the external sensor.

⑥ COMMON terminal

⑦ Alarm reset input connector

Input connector for releasing alarm recording; a +4 to +14 V DC voltage is required.

⑧ REC IN connector

Input connector for recording

⑨ Tape end output connector

When the cassette tape comes to its end during recording, the alarm device installed externally is activated.

⑩ WARNING/REC output connector

When trouble has occurred in the unit, the alarm device installed externally is activated. Error warning or recording low signal selected on the menu screen 3 is output.

⑪ GND Terminal

This terminal is connected to the signal ground terminal of the connected unit in order to reduce noise. It is not connected to ground for safety purposes.

⑫ MIC input jack

Input jack (3 mm) for an external microphone. This jack has precedence when signals are supplied simultaneously to this jack and the audio input connectors.

⑬ REMOTE control connector

For connecting the AG-A11 remote controller which is available as an optional accessory.

⑭ Battery installation area

Install the battery in this area. See "Lithium Battery" on page 3.

Menu Screens

One of the menu screens appears on the TV monitor when the MENU/REC LOCK switch is set to MENU. The display returns to the regular screen when this switch is set to OFF.

- When a menu screen has appeared, the items are set using the page, shift and set buttons.
- Advance through the pages (page up) of the menu screen using the page button.
- Move the items (downward or toward the right) using the shift button.
- Change the items (increment or decrement the values) using the set button.

MENU SCREEN 1

[TIME ADJUST]	P1	①
01- 1-2000 SAT		②
0:00:00		
[REC LOCK]		
MODE : OFF		③
[HOUR METER]		
00000H		④

MENU SCREEN 2

[DISPLAY]	P2	⑤
POSITION : L-UPPER		
[REC INDICATE]		
NOT REC : CAMERA		⑥
[BUZZER]		
ALARM : OFF		⑦
TAPE END : OFF		
TAPE REMAIN : OFF		
ERR WARN : OFF		

MENU SCREEN 3

[ALARM]	P3	⑧
MODE : OFF		⑨
DURATION : 30SEC		
[RECALL]	-	⑩
-		
-		
[OUTPUT SELECT]		
TERMINAL OUT : ERR WARN		⑪

MENU SCREEN 4

[REC MODE]	P4	⑫
REC T-MODE : OFF		⑬
TAPE IN : STOP		⑭
TAPE END : STOP		
[VIDEO MODE]		
MODE : AUTO		⑮
DETAIL : ON		⑯

MENU SCREEN 5

[INTERNAL TIMER REC]	P5	⑰
[TIMER] START END T-M		
SUN OFF		
MON OFF		
TUE OFF		
WED OFF		
THU OFF		
FRI OFF		
SAT OFF		
DLY OFF		

MENU SCREEN 6

[SUMMER TIME]	P6	⑱
MODE : OFF		⑲
[START] [END]		⑳
WEEK : LST-SUN ▶ LST-SUN		
MONTH: 3 ▶ 10		
TIME : 2:00 ▶ 2:00		

MENU SCREEN 1

In addition to the date and time display and the recording mode lock setting which appear on the TV monitor, the hour meter is displayed on Menu Screen 1.

① **Date setting** (see page 12)

② **Time setting** (see page 12)

③ **Recording mode lock**

ON: LOCK on the front display tube flashes, and all operations except for REC REVIEW are prohibited while recording is in progress.

④ **Hour meter**

This indicates the unit's total operation time (the cumulative total for the cylinder rotation time).

Menu Screens

MENU SCREEN 2

The time/date display position, monitor screen blue display and buzzer settings are performed on Menu Screen 2.

5 Display position selection

This selects the position where the date and time are to be displayed on the TV monitor.

(L-UPPER ↔ R-UPPER ↔ L-BOTTOM ↔ R-BOTTOM ↔ CENTRE ↔ OFF ↔ L-UPPER...)

6 Blue display

This sets a blue display on the monitor screen at all times except while recording or playback is in progress.

BLUE: The display on the monitor screen is blue at all times except while recording or playback is in progress.

CAMERA: The pictures from the video input connector are shown on the monitor screen at all times except while playback is in progress.

7 Setting of the buzzer sound

ALARM: The buzzer sounds once alarm recording is performed.

TAPE END: When the tape end is reached in the recording mode, the buzzer sounds while the tape is at the end.

TAPE REMAIN: The buzzer sounds when there is only about 3% (with an NV-E180 tape) of the tape remaining before the end is reached in the recording mode.

ERR WARN: The buzzer sounds when the unit is set to the warning status.

To release the buzzer:

ALARM: Release alarm recording.

TAPE END: Transfer the mode from the tape end or press the STOP button.

TAPE REMAIN: Transfer the mode (but not to PAUSE or REC REVIEW) from the recording mode or press the REC button.

ERR WARN: Release the warning status.

- When TAPE END or TAPE REMAIN has been set to OFF, the buzzer will not sound; however, the REMAIN display will remain lit or flashing.

- When TAPE END or TAPE REMAIN has been set to ON, REMAIN lights or flashes on the display tube at the same time as the buzzer sounds. They cease flashing when the buzzer is released.

Note:

The remaining tape is displayed only with NV-E120 and NV-E180 tapes. It is not displayed when any other tapes are used.

MENU SCREEN 3

The alarm recording mode and terminal output are set on Menu Screen 3.

8 Setting of alarm recording and recording time mode during alarm recording (see page 19)

When there is an alarm input during recording in the time lapse mode, the recording time mode is switched to the designated mode (3H/6H), and the details of the alarm status are faithfully recorded.

9 Alarm recording duration setting

This sets the time allowed to elapse from the start of alarm recording until its end. This time can be set individually from 30 sec. to 10 min.

(30 SEC → 1 MIN → 2 MIN → 3 MIN → 5 MIN → 10 MIN → CONTINUE → MANUAL)

CONTINUE: Alarm recording continues until the tape end.

MANUAL: Alarm recording is performed while the alarm input continues.

10 Alarm recall (see page 20)

This checks the time when an alarm signal was input (up to 4 times).

11 Terminal connector output signal setting

ERR WARN: When trouble has occurred in the unit (AUTO OFF), the LOW signal is output.

REC: The LOW signal is output during recording.

MENU SCREEN 4

Recording mode and video output are selected on Menu Screen 4.

12 Recording time mode selection

When recording starts, the set time mode is always established.

OFF: The time mode can be set as desired using the time mode button on the VTR's sub panel. The mode can be changed even during recording.

3H: 3-hour mode (compatible with the standard mode of ordinary VTR's).

6H: 6-hour mode (compatible with the standard mode of ordinary VTR's).

12H: 12-hour mode (linear slow recording)

24H: 24-hour mode (linear slow recording)

13 Selection of VTR operation when cassette is inserted

STOP: Stop mode

REC: Simply by inserting the cassette tape, recording is started automatically.

REW ► REC: When the cassette is inserted, it is first rewound to the start of the tape and then recording is started automatically.

14 Selection of operation when tape end is detected during recording (see page 18)

STOP: Stop mode

REW: The tape is automatically rewound to the start where it stops.

REPEAT: The tape is automatically rewound to the start, and recording is repeated.

EJECT: The tape is ejected.

15 Video signal mode

This selects the operation of the colour/black-and-white automatic selector circuit.

AUTO: The circuit automatically identifies the type of video input or playback signals, and selects the colour or black-and-white mode accordingly.

COLOUR: The colour mode is forcibly established.

B_W: The black-and-white mode is forcibly established.

16 Playback picture detail selection

The playback pictures can be given a softer look.

OFF: The playback pictures appear softer.

ON: Regular mode

MENU SCREEN 5

The internal timer recording modes are set on Menu Screen 5.

17 Internal timer recording mode setting (see page 16)

This sets the weekly timer or daily timer recording mode. (OFF/ON)

OFF: Internal timer recording is not set.

ON: Internal timer recording is set.

Note:

Internal timer recording does not operate when the date and time have not been set.

MENU SCREEN 6

The summer time mode is set on Menu Screen 6.

18 Selecting the summer time mode

Select the summer time mode.

ON: The summer time mode is selected.

OFF: The summer time mode is not selected.

19 Setting the start time for the summer time mode

Set the week, month and hour at which the summer time mode is to start.

WEEK: Select 1ST, 2ND, 3RD, 4TH or LST (last) and one of SUN through SAT.

MONTH: Select the starting month (1 – 12).

TIME: Select the start time (1:00 – 22:00)*.

20 Setting the end time for the summer time mode

Set the week, month and hour at which the summer time mode is to end.

WEEK: Select 1ST, 2ND, 3RD, 4TH or LST (last) and one of SUN through SAT.

MONTH: Select the ending month (1 – 12).

TIME: Select the end time (1:00 – 22:00)*.

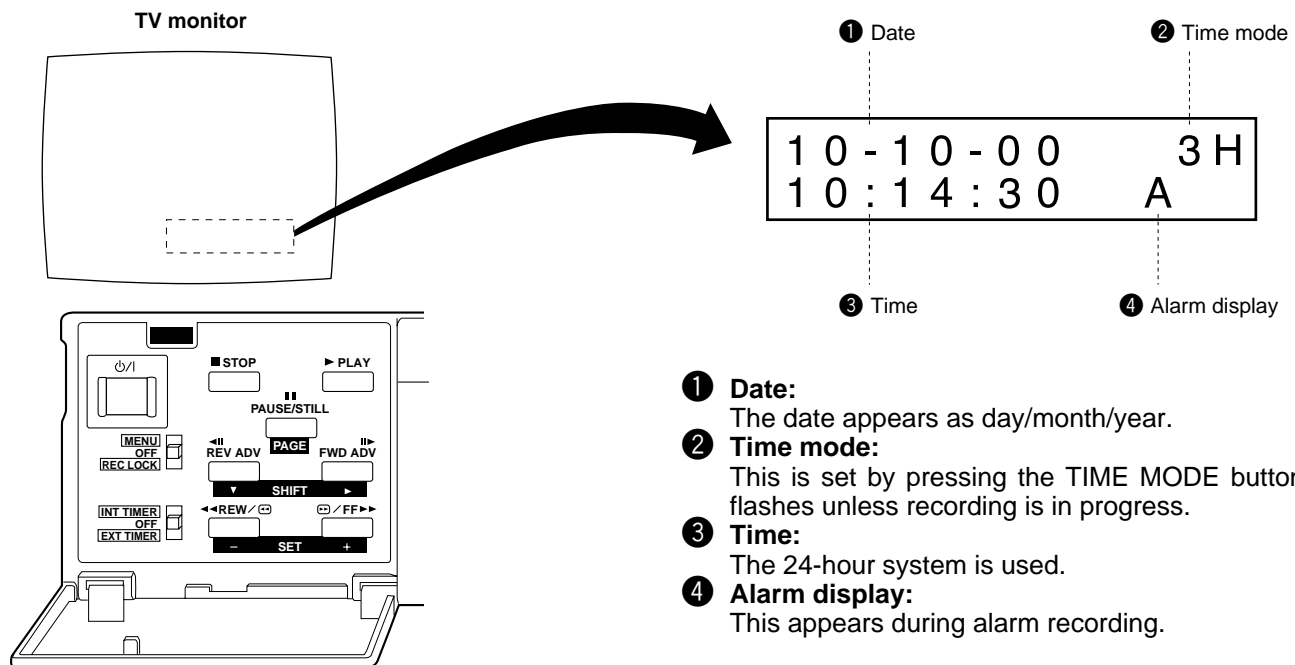
* Minutes are for reference only and cannot be adjusted.

CAUTIONS:

- The menu screens are not displayed while the unit is playing back a tape.
- While the unit is recording, the contents of Menu Screen 1 can be changed; however, Menu Screens 2 to 6 are for reference only and therefore cannot be changed.

Date and Time Settings

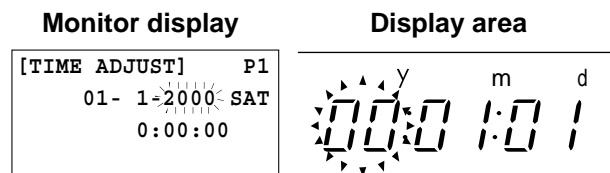
This unit comes with a time/date generator which enables the date and time to be superimposed on the recording. When the power is switched on, the date, time of the day and time mode are displayed (in the case of a regular screen).



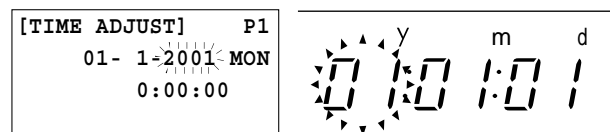
- 1 **Date:**
The date appears as day/month/year.
- 2 **Time mode:**
This is set by pressing the TIME MODE button. It flashes unless recording is in progress.
- 3 **Time:**
The 24-hour system is used.
- 4 **Alarm display:**
This appears during alarm recording.

Example: Setting the date and time to Saturday, March 3, 2001 at 3:25.
The time mode is set to 24 hours.

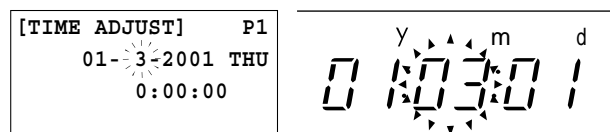
- 1 Set the MENU/REC LOCK switch to MENU. Menu Screen 1 appears, and the year digits flash.



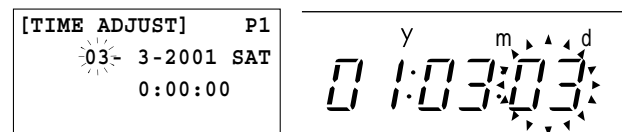
- 2 Press the SET (+, -) buttons to set the year to "2001".



- 3 When the shift (▶) button is pressed, the month digits flash. Press the SET (+, -) buttons to set the month to "3".

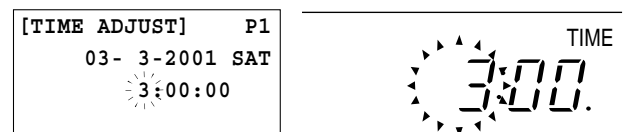


- 4 When the shift (▶) button is pressed, the day digits flash. Press the SET (+, -) buttons to set the day to "03".

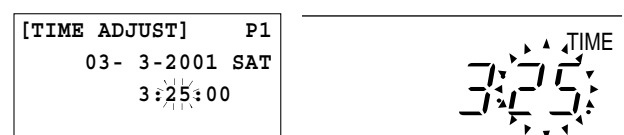


- The year can be set from 2000 to 2079.

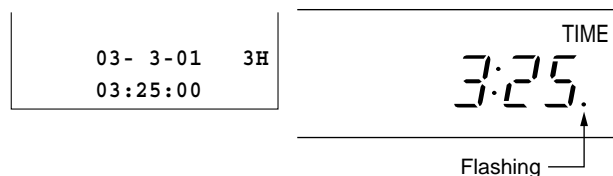
- 5 When the shift (▼) button is pressed, the hour digits flash. Press the SET (+, -) buttons to set the hour to "3".



- 6 When the shift (▶) button is pressed, minute digits flash. Press the SET (+, -) buttons to set the minutes to "25".

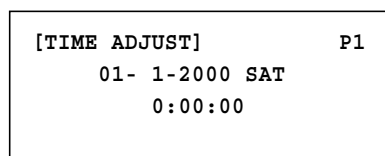


- When the MENU/REC LOCK switch is set to OFF, the clock automatically starts running from time and date set.



For the seconds, "00" is set. Even when the switch is set to MENU, the time will keep advancing if it has not been changed.

- To clear the date and time display, set POSITION under (DISPLAY) on Menu Screen 2 to OFF.
- Even if the power should fail for a period of up to one week, the date, time and time mode display (internal timer setting alarm recall) data are stored in the memory (but only if power has been supplied continuously to the unit for 3 or more days). When the unit has just been purchased or when it has not been used for a long time, the data is not stored in the memory and the display shown below appears.

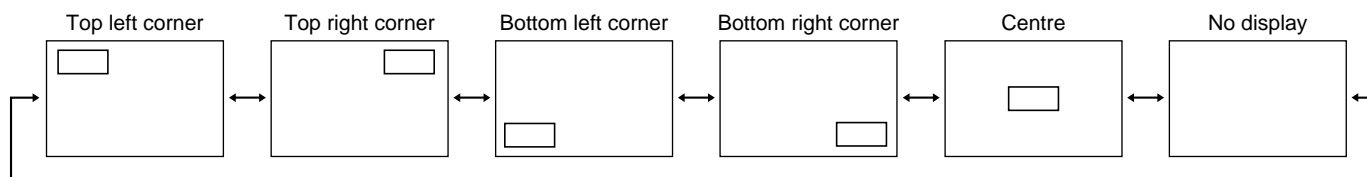


All the internal timer settings are set to OFF, and the alarm recall display is cleared.

- For the date setting, the unit automatically adjusts for leap years.
- Due to temperature fluctuations and other factors, the clock time may run fast or slow with a monthly error of up to ± 60 seconds. This is not indicative of malfunctioning. Reset the time at regular intervals.
- When the time is reset to "0:00:00" as described, check the menu settings. If any of the settings are incorrect, please set them again.

Time/Date Display Position

The position of the date and time displays on the TV monitor changes as shown below when (DISPLAY) on Menu Screen 2 is changed.



- Set the MENU/REC LOCK switch to MENU to display to menu screens. Press the page button to display Menu Screen 2 on the TV monitor.

POSITION : ~~L-UPPER~~

- Press the set (+, -) buttons to position the display as desired.

POSITION : ~~L-BOTTOM~~

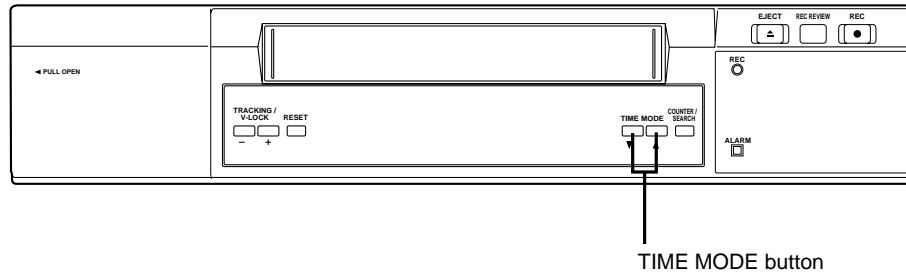
- Upon completion of the settings, set the MENU/REC LOCK switch to OFF. The regular screen is restored, and the date and time appear at the selected position.

TIME/DATE display position adjustment function

When the unit is in STOP or EJECT mode, the position of the displayed time/date can be adjusted by pressing the TRACKING (-) or TRACKING (+) button.

- Pressing the TRACKING (-) button moves the position vertically. (Pressing the button 3 times will return the display to its original position.)
- Pressing the TRACKING (+) button moves the position horizontally. (Pressing the button 3 times will return the display to its original position.)
- Pressing the (-) and (+) buttons simultaneously will return the display to its original position (factory setting).

Time Mode Selection



Refer to the table given below to select the mode that suits the intended purpose of use.

Mode	Recording enable time (in hours)		Tape replacement standard (recording times)	Video recording interval (in seconds)	Audio recording	Type of tape travel
	180-minute tape	120-minute tape				
3H	3	2	----	1/50	Possible	Continuous travel
6H	6	4	----	1/50	Possible	Continuous travel
12H	12	8	50	0.1	Possible	Continuous travel at low speed
24H	24	16	50	0.18	Possible	Continuous travel at low speed

Notes on operation

- This unit is designed with the NV-E180 cassette tape as a reference.
- Depending on the type of video cassette used, the recordable time will differ.
- The actual recording enable time will be slightly longer than the "Recording enable time" given in the above table although this will depend on the tape used.
For instance, it is possible to record for about 27 hours using a 180-minute tape in the 24H mode.
- The 12- and 24-hour modes are time lapse modes. Pictures are recorded with frames skipped to enable lengthy recording and playback.
- A tape recorded in a time lapse (12-/24-hour) mode can be played back in quick motion in the 3-hour mode.
- A tape recorded in the 3-hour mode can be played back in slow motion using the time lapse (12-/24-hour) mode.
- A tape recorded in the 6-hour (or 3-hour) mode cannot be played back in the 3-hour (or 6-hour) mode.
- When a tape recorded on the 6-hour mode is played back in another mode, colour programme is played back in black and white, but this is not a malfunction.
(With still picture, field FWD ADV and field REV ADV operations, the colours at the top of the screen may disappear at some tracking positions, but this is not a malfunction.)
- Tapes recorded on this machine cannot be played back other VHS video recorder as they are not compatible.

Selecting the cassette tape

- The unit is designed as a product required to exhibit high reliability in surveillance, security, monitoring, etc. In order to maintain its recording reliability, it is recommended that the Panasonic video tapes listed below be used.

<VHS tapes>

- NV-E180
- NV-E120
- NV-E90
- NV-E60

- Avoid using 240-minute tapes with this unit.

Recording Procedure

- ① Switch on the power to the connected equipment.
- ② Adjust so that the images of the video cameras appear properly on the TV monitor.
- ③ Check that the date and time displayed on the TV monitor have been adjusted properly.
- ④ Insert a cassette tape into the unit after checking that the tab on the cassette is intact.
- ⑤ Set the timer recording, auto repeat recording, alarm recording, restoration-of-power-after-failure recording or other recording function.
- ⑥ Select the time mode for the recording.
- ⑦ Press the REC button.

Notes on operation

- If the PAUSE/STILL button is pressed during recording, the unit is set to the pause mode, and after about 5 minutes in this mode it is transferred to the stop mode.
- Neat frame-to-frame continuity is not achieved if the recording mode is set again after the PAUSE/STILL button is pressed during recording.
- When the MENU/REC LOCK switch has been set to OFF, other operations can be performed during recording.
- When restoration-of-power-after-failure recording is performed, recording can be continued in the same time mode even if the power should fail provided that the power is restored within about one week. (This applies only if the power has been supplied continuously for 3 or more days.)
- When performing auto repeat recording or timer recording, do not neglect to conduct the routine inspections.
- When recording images from a black-and-white camera, set the video signal mode on Menu Screen 4 to B_W.
- Remove the cassette tape if the unit is to be left standing for a prolonged period of time.
- When the power supply is interrupted during recording (with the ϕ/I switch still ON), a non-recorded portion will be made in the beginning of the tape travel, or the tape will be over-recorded at its ending section. This is not a malfunction.

Tips For Better Recording

In order to ensure greater reliability in monitoring, surveillance and other continuous operations lasting many hours, this unit comes with some safety functions for recording. Read the following descriptions of these functions before proceeding to operate the unit.

Recording mode lock

There are two ways, as described below, to maintain the recording mode during recording by disabling the operations of the ϕ/I switch as well as the TIME MODE and operation buttons.

- ① Set the MENU/REC LOCK switch to REC LOCK.
- ② Set REC LOCK on Menu Screen 1 to ON. (See Note)

The following button and connectors are operational during recording even if the unit is set to REC LOCK.

- Alarm input connector, alarm reset connector
- REC REVIEW

Recording check

When the REC REVIEW button is pressed during recording, the tape runs temporarily in the reverse direction, and the recorded section is played back. This function can be used to check the daily operation of the equipment in the system.

Restoration-of-power-after-failure recording

When a power failure has occurred during recording, the unit automatically starts recording if the power is restored within approximately one week.

- When the power fails, the tape "loss" safety protection function is activated to protect the video heads and video tape.

Before power is restored	After power is restored
• Stop, play, fast forward	Stop mode is established.
• Recording	Recording mode is established.
• Auto rewind • Auto rewind during auto repeat recording	Unit is returned to the mode applying before the power failed.

Notes:

- When the power cord has come out of the socket or a power failure has occurred, no operations will be acknowledged for about 30 seconds after the power has been restored: this is to protect the tape.
- Once the recording mode is established, recording cannot be released until REC LOCK on Menu Screen 1 is set OFF.

Timer Recording

There are two methods of timer recording: one uses the internal timer and the other uses an external timer.

Internal timer recording

Start time and stop time

Bear in mind the following points when setting these times.

- **When the stop time is set later than the start time:**
Recording will commence at the start time on the day concerned and stop at the end time on the same day.
Example: 8:30 → 17:00
- **When the start time is set later than the stop time or the start time and stop time for weekly recording (weekly timer) are the same:**
Recording starts at the start time on the day concerned and ends at the stop time on the following day.
Example: 17:00 → 8:30
- **When the start time and stop time are the same (for weekly recording):**
Recording starts at 8:30 on the day concerned and ends at 8:30 on the following day.
Example: 8:30 → 8:30
To record for an entire day, set the start time and stop time to 0:00.

Notes:

- Weekly recording (weekly timer) can be set by the day of the week.
- When (INTERNAL TIMER REC) on Menu Screen 5 is set to OFF for both the weekly timer and daily recording (daily timer), nothing appears for the start or stop time. Timer recording is considered not to be set.

Internal timer recording operation

- 1 Check that a video cassette with its tab intact has been inserted.
- 2 Check that the TV monitor shows the correct present time.
- 3 Set the MENU/REC LOCK switch to MENU to display the menu screens. Press the page button so that the INTERNAL TIMER REC timer setting screen appears on the TV monitor.

[INTERNAL TIMER REC]	P5	
[TIMER] START	END	T-M
SUN	OFF	
MON	OFF	
TUE	OFF	
WED	OFF	
THU	OFF	
FRI	OFF	
SAT	OFF	
DLY	OFF	

VTR operations after the settings

- The unit is in STANDBY mode, and even if other buttons are pressed, their operations are not accepted.
- When the start time and stop time have not been set, INT flashes on the display.
- Alarm recording is performed in the event of an alarm input even when the unit is in the timer recording standby mode. When alarm recording is completed, the unit is set to the timer recording standby mode.
- Even when the power should fail, the start and stop times set for timer recording are stored in the memory provided that the power is restored within a week or so (but only if power has been supplied continuously to the unit for 3 or more days).
- When the unit has just been purchased or when it has not been used for a long time, the start and stop times are not stored in the memory.

Releasing the internal timer mode

Set the TIMER MODE switch to OFF to clear INT on the display.

Note:

- Since it takes some moments for recording to start, set the start time for timer recording one minute earlier.

- 4 Set the operation times of the internal timer.
 - For details on the settings, refer to the sections on "Daily timer" or "Weekly timer." (See page 17.)
- 5 Upon completion of the settings, set the MENU/REC LOCK switch to OFF. The regular screen is restored.
- 6 Set the TIMER MODE switch to INT TIMER so that INT lights on the display.
When the time and date for Menu Screen 1 have not been set, a cassette has not been inserted, the timer has not been set, or when a cassette with a broken out tab has been inserted, the buzzer sounds and INT flashes on the display.

Daily Recording (Daily Timer)/Weekly Recording (Weekly Timer)

Example: When recording from 8:30 to 12:00 from Sunday through Thursday and from 9:00 to 12:00 on Fridays and Saturdays

- 1 Check that OFF or ON for Sunday (SUN) is flashing. If the setting is OFF, press the set (+, -) buttons to display ON.

```
[INTERNAL TIMER REC] P5

[TIMER] START  END  T-M
SUN OFF
MON OFF
```

- 2 When the shift (▶) button is pressed, the setting moves to the start time and the "hour" digits flash.

SUN ON 0:00▶ 0:00

- 3 Press the set (+, -) buttons to display "8."

SUN ON 8:00▶ 0:00

- 4 When the shift (▶) button is pressed, the "minutes" digits flash.

SUN ON 8:00▶ 0:00

- 5 Press the set (+, -) buttons to display "30."

SUN ON 8:30▶ 0:00

- 6 When the shift (▶) button is pressed, the "hour" digits flash.

SUN ON 8:30▶ 0:00

- 7 Press the set (+, -) buttons to display "12."

SUN ON 8:30▶ 12:00

- 8 When the shift (▶) button is pressed, the "minutes" digits flash.

SUN ON 8:30▶ 12:00

- 9 Press the set (+, -) buttons to display "00."

SUN ON 8:30▶ 12:00

- 10 Press the shift (▶) button and set the recording time mode. When the shift (▼) button is pressed, the MON is flashing.

SUN ON 8:30▶ 12:00 24

- 11 Following the same procedure in steps 1 to 10, display the start time of "8:30" and stop time of "12:00" from Monday (MON) through Thursday (THU). Following the above procedure, set the times for Friday (FRI) and Saturday (SAT) as well. In this way, the timer operation times have been set for each day of the week.

The settings for daily recording (daily timer) are also performed following the same steps 1 to 10.

- The setting shown on the screen at the left translates into the weekly and daily timer recording combinations shown below which, in turn, means that the actual recording time on the tape is shown at the bottom.

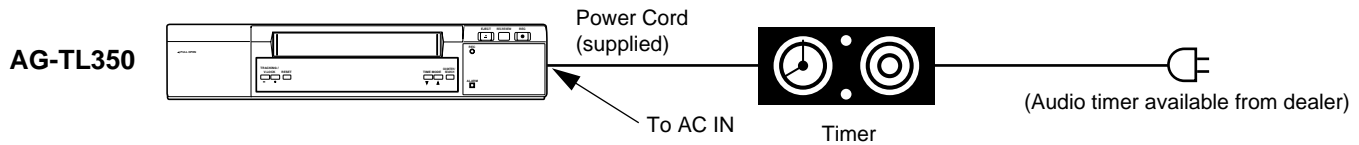
[INTERNAL TIMER REC] P5				Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
[TIMER] START	END	T-M		24H	24H	12H		12H		24H
SUN ON 8:30	8:00	24	Weekly Timer	8:00 8:30	8:00 14:00			14:00 23:00		12:00
MON ON 12:00	14:00	12			12H					
TUE OFF			Daily Timer	12H	12H					
WED OFF				8:00 18:00	8:00 12:00					
THU ON 14:00	23:00	12								
FRI OFF			Actual Recording Time	24H	24H	12H	12H	12H	12H	12H
SAT ON 12:00	8:00	24		8:00 8:30	8:00 14:00	8:00 18:00	8:00 18:00	8:00 14:00	8:00 18:00	18:00 8:00 12:00
DLY ON 18:00	8:00	12								

- The day of the week time settings are displayed, enabling the settings to be checked for each day of the week.
- Proceed with the setting due consideration given to the total recording time since a 180-minute tape is long enough to provide recording for up to 24 hours only.

Timer Recording

External Timer Recording

The unit can be made to record using an external timer to turn on its power.



External timer recording operations

- 1 Check that a video cassette with its tab intact has been inserted.
 - 2 Set the TIMER MODE (REC MODE) switch to EXT TIMER so that EXT lights on the display. At the set time, power is supplied from the external timer and the unit is set to the recording mode.
- If the video cassette tape has not been inserted or if its accidental erasure prevention tab has been broken, EXT will flash on the display, and external timer recording cannot be conducted.
 - Since it takes some moments for recording to start, set the start time for timer recording one minute earlier.
 - Depending on the tape position, some of the images at the start of the external timer recording may not be recorded or may record over the images at the end of the previous external timer recording.

Auto Repeat Recording/Auto Rewinding

Auto repeat recording: This function automatically rewinds the cassette tape when its end is detected in the recording mode, and it repeats recording from the start of the tape.

Auto rewinding: This function automatically rewinds the tape to the start when the tape end is detected in the recording mode.

- 1 Check that a video cassette with its tab intact has been inserted.
- 2 Set the MENU/REC LOCK switch to MENU to display the menu screens. Press the page button to display Menu Screen 4 on the TV monitor.
- 3 Press the shift (▼) button to move the flashing to TAPE END. Press the set (+ or -) button to display REPEAT for auto repeat recording or REW for auto rewinding.

TAPE END : REPEAT
- 4 "R" lights on the display.
 - If auto rewinding has been selected, "R" is cleared.
- 5 Upon completion of the settings, set the MENU/REC LOCK switch to OFF. The regular screen is restored.

```
[REC MODE] P4
REC T-MODE : OFF
TAPE IN : STOP
TAPE END : STOP

[VIDEO MODE]
MODE : AUTO
DETAIL : ON
```

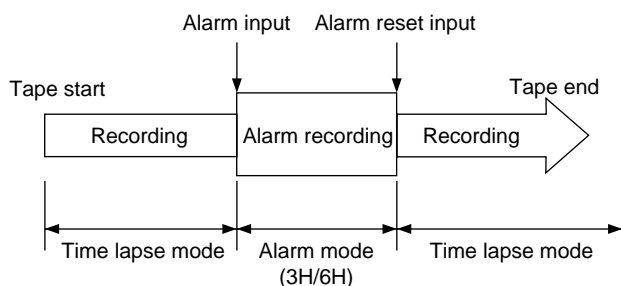
Notes of operation

- When auto repeat recording is to be performed, do not neglect the routine inspections. Since the image deteriorates when the same tape is used over and over again for auto repeat recording, replace the tape with a new one after about 50 recordings.
- Alarm signals are not accepted during auto rewinding, and so alarm recording is not performed.
- If an alarm signal is supplied during auto repeat recording, the alarm recording mode is established. If the tape then reaches its end, auto repeat recording is performed but alarm recording is released.
- When the power cord has come out of the socket or a power failure has occurred, no operations will be acknowledged for about 30 seconds after the power has been restored: this is to protect the tape.

Alarm Recording (Emergency Recording)

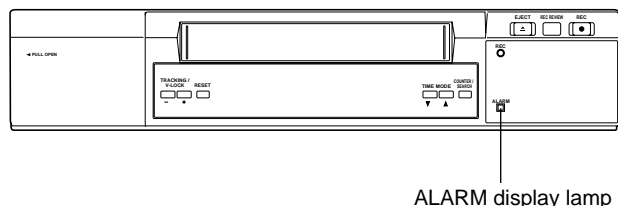
When an emergency occurs at the monitoring site during prolonged monitoring and recording, the alarm function is automatically triggered, and alarm recording is performed.

Principle of alarm recording

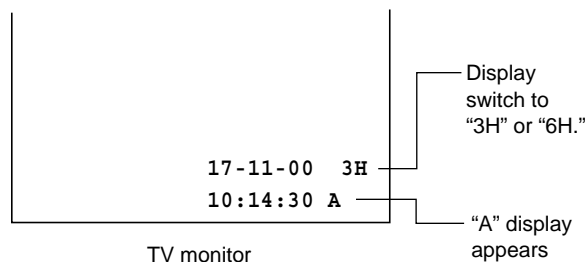
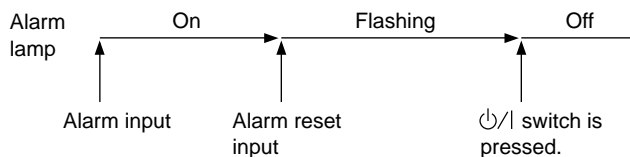


- When an alarm signal is supplied by an alarm sensor (door or intercom switch, etc.) during recording in a time lapse mode, the recording speed is switched to the 3- or 6-hour mode and the details of the state of emergency are faithfully recorded.

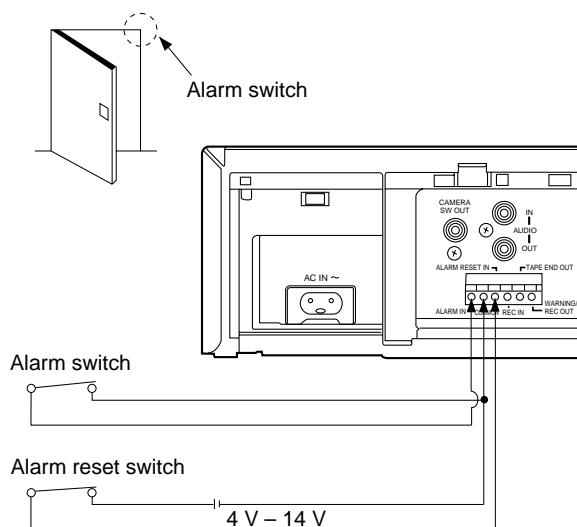
Alarm and display methods during alarm recording



- When an alarm signal is supplied, the alarm display lamp functions as follows.



Connecting the alarm input connector



- Alarm recording starts when the alarm switch is set on. When the alarm reset switch is set ON after recording has started, alarm recording is released and operation is returned to the original time lapse recording mode.
- Alarm recording can be released by pressing the STOP button during alarm recording. However, it cannot be released even by pressing the STOP button if the MENU/REC LOCK switch is at REC LOCK or INT is lighted on the display.
- Alarm recording can be automatically reset without supplying the alarm reset input signal. The reset time can be set for 30 sec., 1.0, 2.0, 3.0, 5.0 or 10 minutes.
- Another option is alarm recording only while the alarm input signal is supplied.
- Alarm recording is also possible as far as the end of the tape.

Alarm Recording (Emergency Recording)

Alarm recording operation

- 1 Check that a video cassette with its tab intact has been inserted.
- 2 Set the MENU/REC LOCK switch to MENU to display the menu screens. Press the page button to display the alarm recording setting screen (Menu Screen 3) on the TV monitor.

```
[ALARM] P3
      MODE : OFF
      DURATION : 30SEC

[RECALL] -
          -
          -
```

- 3 Press the set (+ or -) button to display 3H or 6H for MODE.

```
MODE      3H
```

- 4 Press the shift (▼) button to move the flashing to DURATION.
Press the set (+ or -) button to set the recording duration.
- 5 Upon completion of the settings, set the MENU/REC LOCK switch to OFF. The regular screen is restored.
- 6 Press the REC button.
If an alarm input signal is subsequently supplied, the time mode set by T-MODE changes to 3H or 6H, and alarm recording continues until the alarm is released.

- If TAPE END on Menu Screen 4 has been set to REPEAT, the auto repeat recording mode is established when the tape comes to the end.
- With emergency recording, set the unit to the STANDBY or STOP mode.

Alarm Recall

The time when the alarm signal was input can be ascertained on the TV monitor by checking the alarm input time in the RECALL item on Menu Screen 3.

- 1 Set the MENU/REC LOCK switch to MENU to display the menu screens. Press the page button to display the alarm recording setting screen (Menu Screen 3) on the TV monitor.
- 2 Upon completion of the settings, set the MENU/REC LOCK switch to OFF. The regular screen is restored.

```
[ALARM] P3
      MODE : ALARM
      DURATION : 30SEC

[RECALL] 10-10-01 20:19
          14- 9-01 12:05
          30- 8-01 08:40
          25- 6-01 04:14

[OUTPUT SELECT]
      TERMINAL OUT : ERR WARN
```



- The alarm recall function stores up to 4 alarm input times in the memory and displays them on the screen. If there have been more than 4 inputs, they will be deleted from the screen in sequence starting with the oldest data.
- When the RESET button is pressed while Menu Screen 3 is on the display, the alarm recall memory can be cleared.

Playback Procedure

Before operating the unit, check that the internal/external timer recording displays (INT/EXT) have been cleared from the display. (If INT or EXT is displayed, set the TIMER MODE switch to OFF to clear it.)

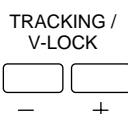
- ❶ Switch on the power to the unit and TV monitor.
- ❷ Insert the recorded cassette tape into the unit.
- ❸ Select the time mode.
- ❹ Press the PLAY button.

Notes on operation

1. Bear in mind the following points when playing back parts of a tape recorded in a time lapse (12-/24-hour) mode.
 - When the tape is played back in the same mode, noise resembling dropouts will appear on the screen: this is not indicative of malfunctioning.
 - The picture may oscillate in the vertical direction: this is not indicative of malfunctioning.
 - When a tape is played back in the same time mode, the picture may shake slightly sideways: this is not indicative of malfunctioning.
 - Turn Quasi-V insertion ON () or OFF () with the FWD ADV button. Dancing can be minimized when a tape is played back in a time lapse (except 3- or 6-hour) or linear slow mode. Moreover, playing back a tape in a system featuring a frame switcher enables the appearance of the pictures of other cameras to be reduced.
2. Bear in mind the following points when playing back parts of a tape recorded in a VHS mode (3 or 6 hours).
 - When a tape is played back in a time lapse mode, slight noise may appear at the top and bottom of the screen: this is not indicative of malfunctioning.
 - When the tape is played back in the 12H or 24H mode, the picture may oscillate in the vertical direction: this is not indicative of malfunction.
 - When a tape recorded on the 6-hour mode is played back in another mode, colour programme is played back in black and white, but this is not a malfunction.
3. When noise has occurred during still-picture playback, press the FWD ADV button to play it out. (It may not always be possible to play out the noise.)
4. Bear in mind that if the power cable is disconnected and then re-connected or if the power has been restored after it has failed when the tape was played with EXT indicated on the display by the TIMER MODE switch, the unit will automatically be set from playback to the recording mode.
5. When the PAUSE/STILL button is pressed during playback, the unit is set to the pause mode, and a still picture will appear on the monitor screen. To release this state, press the PAUSE/STILL button again or press the PLAY button. If the unit is kept in the pause mode for more than 5 minutes, it will be set to the stop mode.
6. If the horizontal AFC on the TV monitor is too long or when a video camera with random interlace scanning has been used, the top area of the TV monitor may be distorted: this is not indicative of malfunctioning.
7. Tapes recorded on this machine cannot be played back other VHS video recorder as they are not compatible.
8. When the power cord has come out of the socket or a power failure has occurred during fast forwarding or rewinding, no operations will be acknowledged for about 30 seconds after the power has been restored: this is to protect the tape.

Tracking

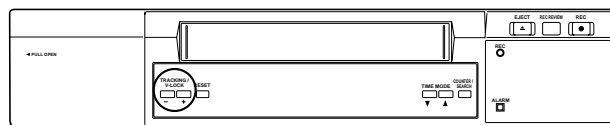
When noise such as that shown below appears on the playback image in the 3- or 6-hour time mode, press the tracking (+ or -) button to minimize the noise.



- For the tracking default setting, press the "+" and "-" buttons together (in the 3- or 6-hour time mode only).
- In the 12- or 24-hour mode, press the "+" or "-" button to adjust the tracking.

Vertical hold adjustment

If the image shakes slightly in the vertical direction during still-picture playback, press the V-LOCK buttons (-, +) to reduce the dancing.



- If the TV monitor has a vertical hold control, adjust that control also.

Routine & Regular Inspection Request

This unit is designed to withstand many hours of operation. Nevertheless, it is recommended that routine inspections be conducted to help ensure trouble-free operation.

CAUTION

Do not forget to conduct the routine inspection with auto repeat recording.

Routine inspection procedure

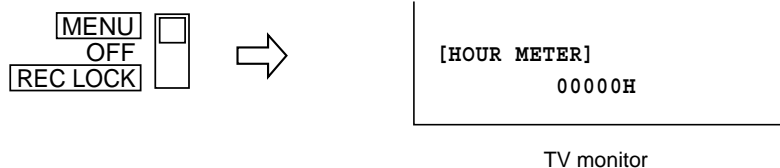
- ① Set the power switches on the unit, video cameras, TV monitor and other equipment connected in the monitoring system to the ON position.
- ② Is the picture on the TV monitor OK?
- ③ Are the date and time displayed on the TV monitor correct?
- ④ Press the REC REVIEW button during the recording and check that the image are being recorded correctly.

Action taken after routine inspections

In the unlikely event of a problem with the unit, turn the unit to STANDBY mode, take hold of the power plug and disconnect it from the power outlet, and consult with the dealer from whom the unit was purchased.

Regular inspections recommended

This unit has an hour meter which shows for how many hours the VTR has been used. When the MENU/REC LOCK switch is set to MENU, Menu Screen 1 appears on the TV monitor, and the hour meter can be checked. Use the hour meter as a rough guideline to cleaning or replacing the parts inside the unit. The regular screen is restored when the MENU/REC LOCK switch is set to OFF. For further details, consult with your dealer.




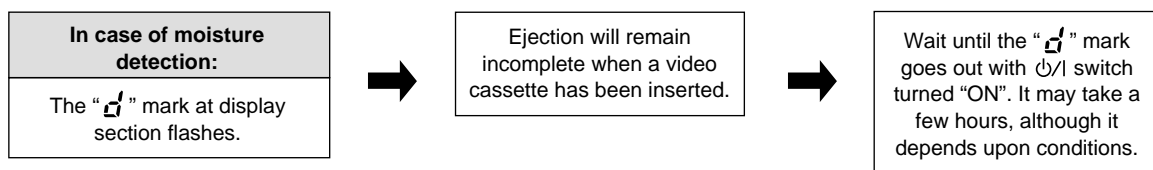
Troubleshooting

Trouble with installation

- | | |
|---------------------|---|
| No power. | • Is the power plug inserted properly into the AC outlet? |
| No picture. | • Is the unit connected properly with the TV, video cameras, etc.?
• Are any of the connecting cables making faulty contact? |
| Indistinct picture. | • Has the focus on the video cameras been adjusted correctly? |

Trouble with functions or operation

- | | |
|---|---|
| Nothing happens even when operation buttons are pressed. | • Is the video cassette loaded?
• Is the MENU/REC LOCK switch at OFF?
• Has the video cassette been inserted properly? Press the EJECT button to eject the cassette and insert properly.
• Has INT lighted on the display? |
| "  " mark is flashing. | • The unit will not operate because its safety protection function has been triggered. Wait until the flashing disappears. |



- | | |
|---|---|
| Date and time display data has not been stored in memory when the power failed. | • Has the unit's power plug been disconnected from the power outlet for a long time?
Insert the unit's power plug into the power outlet and supply power continuously for at least 3 days to the unit. |
|---|---|

Trouble with recording

- | | |
|--|--|
| Tape can be played, fast forwarded or rewind but not recording results. | • Is the tab on the video cassette broken? |
| Recording has stopped. | • Is the video cassette tape at its end?
• Have more than 5 minutes elapsed since the PAUSE/STILL button was pressed during recording?
• Are the routine inspections being carried out? If this phenomenon keeps recurring, it means that some failure or other is to blame. Consult with your dealer. |
| The power has been restored after a power failure but recording does not automatically resume. | • Has the power failure lasted a long time (more than 1 week)?
Set the timer recording switch to EXT to ensure that the unit is set to the recording mode even after a prolonged power failure. |
| Recording cannot be stopped. | • First set the MENU/REC LOCK switch to OFF and then operate.
• Is REC LOCK on Menu Screen 1 at OFF? |
| 1-week programmed timer recording cannot be conducted properly. | • Are the date and time on the regular displays correct? (See page 12) |
| One or more cameras do not record when a multiple number of cameras are used. | • Turn the time adjustment control on the frame switcher, and adjust it to a setting which is longer than the video recording duration in the recording time mode.
• Connect a camera switching cable between the unit and frame switcher. |
| No auto repeat recording. | • Has the stop button been pressed during auto rewinding? |

Troubleshooting

No timer recording.

- Are the present time and start/stop times for the timer recording correct?
- Has INT or EXT lighted on the display?

No alarm recording.

- Have the alarm sensors and alarm input connectors been connected properly?
- Has the alarm recording mode been selected on Menu Screen 3?

Trouble with playback

Noise sometimes appears on the playback pictures.

- Adjust the tracking buttons. (See page 21)

Dirty playback picture.

- The video heads may be dirty or clogged or they may have reached the end of their service life. Consult with your dealer.

"Snow" on playback picture.

- The video heads may be dirty or clogged. Consult with your dealer.

While a multiple number of cameras are being used, two scenes appear as the playback picture when the cameras are switched.

- Has the camera switching signal cable been connected properly?

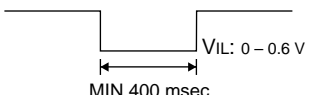
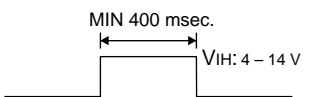
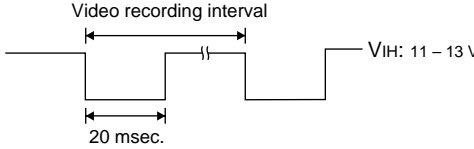
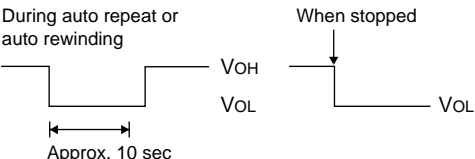
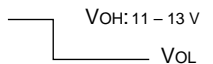
Recording starts when the unit's power plug is connected to or disconnected from the power outlet.

- Has INT or EXT lighted on the display?

No playback because recording starts when the main power for the connected equipment is set to ON.

- Has INT or EXT lighted on the display?

Input/Output Terminal Signal Level

Terminal	Signal Level	Note
Alarm Input/REC IN		LOW Input
Alarm Reset Input		HIGH Input
Camera Switching Output		$V_{OH} = 11 - 13 \text{ V (} 5.6 \text{ k}\Omega \text{)}$ $V_{OL} = 0 - 0.6 \text{ V (max. 3 mA)}$
Tape end output		$V_{OH} = 11 - 13 \text{ V (} 4.7 \text{ k}\Omega \text{)}$ $V_{OL} = 0 - 0.6 \text{ V (max. 3 mA)}$
Warning output		$V_{OH} = 11 - 13 \text{ V (} 4.7 \text{ k}\Omega \text{)}$ $V_{OL} = 0 - 0.6 \text{ V (max. 3 mA)}$

Specifications

Power Source:	220 – 240 V AC, 50 – 60 Hz
Power Consumption:	20 W

General

Operating Temperature:	5°C to 40°C
Operating Humidity:	35% to 80%
Dimensions:	430 (W) × 88 (H) × 293.5 (D) mm
Weight:	Approx. 3.7 kg
Video Recording/ Playback System:	4 rotary heads, Azimuth recording system, VHS format
Tape Speed:	23.39 mm/s (3H mode)
Tape Format:	VHS tape
Recording Time:	3 hours (with 180-minute tape/3H mode)
FF/REW Time:	Less than 2 min. (with 180-minute tape)

Video

Television System:	CCIR Standard (625 lines, 50 fields) PAL colour signal
Modulation System:	Luminance; Frequency modulation recording Colour signal; Converted subcarrier phase shift recording
Video Input (BNC):	1.0 Vp-p, 75 ohms
Video Output (BNC):	1.0 Vp-p, 75 ohms, unbalanced
S/N:	B/W mode; 45 dB (3H mode, Detail OFF) Colour mode; 45 dB (3H mode, Detail OFF)

Audio

Line Input (Phono):	–10 dBV, 47 kohms
Mic Input (3 mm):	–60 dBV, 600 ohms
Line Output (Phono):	–8 dBV, 1 kohm
Track:	1 track (normal)
Recording/ Playback mode:	3H/6H/12H/24H mode

Connectors

Alarm Input/ REC IN:	Short circuit
Alarm Reset Input:	+4 V – +14 V

Standard accessory

Power Cord:	× 1
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Weight and dimensions shown are approximate.
Specifications are subject to change without notice.

Matsushita Electric Industrial Co., Ltd.

Central P.O. Box 288, Osaka 530-8691, Japan

Printed in Japan
VQT8975

S1000H100



WARNING

This service information is designed for experienced repair technicians only and is not designed for use by the general public. It does not contain warnings or cautions to advise non-technical individuals of potential dangers in attempting to service a product. Products powered by electricity should be serviced or repaired only by experienced professional technicians. Any attempt to service or repair the product or products deal with in this service manual by anyone else could result in serious injury or death.

Specifications

Power Source:	220 – 240 V AC, 50 – 60 Hz
Power Consumption:	20 W

General

Operating

Temperature: 5 °C to 40 °C

Operating

Humidity: 35% to 80%

Dimensions:

430 (W) × 88 (H) × 293.5 (D) mm

Weight:

Approx. 3.7 kg

Video Recording/

Playback

System: 4 rotary heads, Azimuth recording system, VHS format

Tape Speed:

23.39 mm/s (3H mode)

Tape Format:

VHS tape

Recording Time:

3 hours (with 180-minute tape/3H mode)

FF/REW Time:

Less than 2 min. (with 180-minute tape)

Video

Television

System: CCIR Standard (625 lines, 50 fields)
PAL colour signal

Modulation

System: Luminance; Frequency modulation recording
Colour signal; Converted subcarrier phase shift recording

Video Input

(BNC): 1.0 Vp-p, 75 ohms

Video Output

(BNC): 1.0 Vp-p, 75 ohms, unbalanced
S/N: B/W mode; 45 dB (3H mode, Detail OFF)
Colour mode; 45 dB (3H mode, Detail OFF)

Audio

Line Input

(Phono): –10 dBV, 47 kohms

Mic Input (3 mm):

–60 dBV, 600 ohms

Line Output

(Phono): –8 dBV, 1 kohm

Track:

1 track (normal)

Recording/

Playback

mode: 3H/6H/12H/24H mode

Connectors

Alarm Input/

REC IN: Short circuit

Alarm Reset

Input: +4 V – +14 V

Standard accessory

Power Cord: × 1

Weight and dimensions shown are approximate.
Specifications are subject to change without notice.

Caution for AC Mains Lead

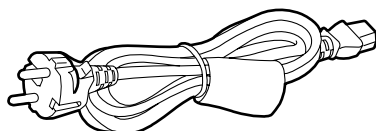
FOR YOUR SAFETY PLEASE READ THE FOLLOWING TEXT CAREFULLY.

This product is equipped with 2 types of AC mains cable. One is for continental Europe, etc. and the other one is only for U.K.

Appropriate mains cable must be used in each local area, since the other type of mains cable is not suitable.

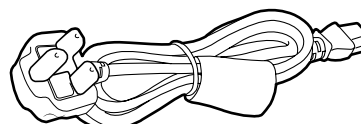
FOR CONTINENTAL EUROPE, ETC.

Not to be used in the U.K.



FOR U.K. ONLY

If the plug supplied is not suitable for your socket outlet, it should be cut off and appropriate one fitted.



FOR U.K. ONLY

This appliance is supplied with a moulded three pin mains plug for your safety and convenience.

A 13 amp fuse is fitted in this plug.

Should the fuse need to be replaced please ensure that the replacement fuse has a rating of 13 amps and that it is approved by ASTA or BSI to BS1362.

Check for the ASTA mark  or the BSI mark  on the body of the fuse.

If the plug contains a removable fuse cover you must ensure that it is refitted when the fuse is replaced.

If you lose the fuse cover the plug must not be used until a replacement cover is obtained.

A replacement fuse cover can be purchased from your local Panasonic Dealer.

IF THE FITTED MOULDED PLUG IS UNSUITABLE FOR THE SOCKET OUTLET IN YOUR HOME THEN THE FUSE SHOULD BE REMOVED AND THE PLUG CUT OFF AND DISPOSED OF SAFELY. THERE IS A DANGER OF SEVERE ELECTRICAL SHOCK IF THE CUT OFF PLUG IS INSERTED INTO ANY 13 AMP SOCKET.

If a new plug is to be fitted please observe the wiring code as shown below.

If in any doubt please consult a qualified electrician.

WARNING: THIS APPLIANCE MUST BE EARTHED.

IMPORTANT: The wires in this mains lead are coloured in accordance with the following code:

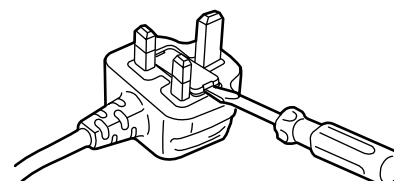
Green-and-Yellow:	Earth
Blue:	Neutral
Brown:	Live

As the colours of the wires in the mains lead of this appliance may not correspond with the coloured markings identifying the terminals in your plug, proceed as follows:

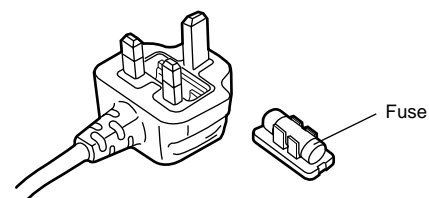
- The wire which is coloured GREEN-AND-YELLOW must be connected to the terminal in the plug which is marked with the letter E or by the Earth symbol \perp or coloured GREEN or GREEN-AND-YELLOW.
- The wire which is coloured BLUE must be connected to the terminal in the plug which is marked with the letter N or coloured BLACK.
- The wire which is coloured BROWN must be connected to the terminal in the plug which is marked with the letter L or coloured RED.

How to replace the fuse

1. Open the fuse compartment with a screwdriver.



2. Replace the fuse.



SAFETY PRECAUTIONS

GENERAL GUIDELINES

1. When servicing, observe the original lead dress. If a short circuit is found, replace all parts which have been overheated or damaged by the short circuit.
2. After servicing, see to it that all the protective devices such as insulation barriers, insulation papers shields are properly installed.
3. After servicing, make the following leakage current checks to prevent the customer from being exposed to shock hazards.

LEAKAGE CURRENT COLD CHECK

1. Unplug the AC cord and connect a jumper between the two prongs on the plug.
2. Measure the resistance value, with an ohm meter, between the jumpered AC plug and each exposed metallic cabinet part on the equipment such as screwheads, connectors, control shafts, etc. The resistance value must be more than 5M Ω .

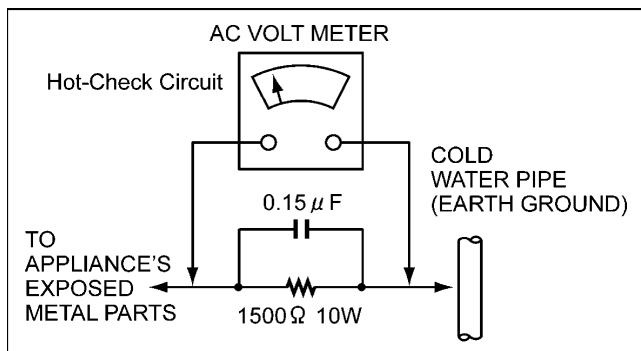


Figure1

LEAKAGE CURRENT HOT CHECK (See Figure 1)

1. Plug the AC cord directly into the AC outlet.
Do not use an isolation transformer for this check.
2. Connect a 1.5k Ω , 10W resistor, in parallel with a 0.15 μ F capacitor, between each exposed metallic part on the set and a good earth ground such as a water pipe, as shown in Figure1.
3. Use an AC voltmeter, with 1000 ohms/volt or more sensitivity, to measure the potential across the resistor.
4. Check each exposed metallic part, and measure the voltage at each point.
5. Reverse the AC plug in the AC outlet repeat each of the above measurements.
6. The potential at any point should not exceed 0.15 volts RMS. A leakage current tester (Simpson Model 229 equivalent) may be used to make the hot checks, leakage current must not exceed 0.1 milliamp. In case a measurement is outside of the limits specified, there is a possibility of a shock hazard, and the equipment should be repaired and rechecked before it is returned to the customer.

ELECTROSTATICALLY SENSITIVE (ES) DEVICES

Some semiconductor (solid state) devices can be damaged easily by static electricity. Such components commonly are called Electrostatically sensitive (ES) Devices. Examples of typical ES devices are integrated circuits and some field-effect transistors and semiconductor "chip" components. The following techniques should be used to help reduce the incidence of component damage caused by static electricity.

1. Immediately before handling any semiconductor component or semiconductor-equipped assembly, drain off any electrostatic charge on your body by touching a known earth ground.
Alternatively, obtain and wear a commercially available discharging wrist trap device, which should be removed for potential shock reasons prior to applying power to the unit under test.
2. After removing an electrical assembly equipped with ES devices, place the assembly on a conductive surface such as aluminum foil, to prevent electrostatic charge buildup or exposure of the assembly.
3. Use only a grounded tip soldering iron to solder or unsolder ES devices.
4. Use only an anti-static solder removal device classified as "anti-static" can generate electrical charges sufficient to damage ES devices.
5. Do not use freon-propelled chemicals. These can generate electrical charges sufficient to damage ES devices.
6. Do not remove a replacement ES device from its protective package until immediately before you are ready to install it.
(most replacement ES devices are packaged with leads electrically shorted together by conductive foam, aluminum foil or comparable conductive material).
7. Immediately before removing the protective material from the leads of a replacement ES device, touch the protective material to the chassis or circuit assembly into which the device will be installed.
CAUTION : Be sure no power is applied to the chassis or circuit, and observe all other safety precautions.
8. Minimize bodily motions when handling unpacked replacement ES devices. (Otherwise harmless motion such as the brushing together of your clothes fabric or the lifting of your foot from a carpeted floor can generate static electricity sufficient to damage an ES device).

X-RADIATION

WARNING

1. The potential source of X-radiation in EVF sets is the High Voltage section and the picture tube.
2. When using a picture tube test jig for service, ensure that jig is capable of handling 10kV without causing x-radiation.

Note : It is important to use an accurate periodically calibrated high voltage meter.

3. Measure the High Voltage. The meter (electric type) reading should indicate 2.5kV, \pm 0.15kV. If the meter indication is out of tolerance, immediate service and correction is required to prevent the possibility of premature component failure. To prevent an x-radiation possibility, it is essential to use the specified picture tube.

Panasonic